This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

B 940,848

1817
ARTES VERITAS SCIENTIA
LIBRARY OF THE
UNIVERSITY OF MICHIGAN
TUEBOR
SI QUAERIS PENINSULAM AMOENAM
CIRCUMSPICE
Public
Health

THE GIFT OF
Henry F. Vaughan

Public Health
RA
87
.B1

[illegible] [illegible] of [illegible] [illegible]

SIXTEENTH ANNUAL REPORT

OF THE

SECRETARY

OF THE

STATE BOARD OF HEALTH

OF THE

STATE OF MICHIGAN,

FOR THE

FISCAL YEAR ENDING JUNE 30, 1888.

BY AUTHORITY.

LANSING:
DARIUS D. THORP, STATE PRINTER AND BINDER.
1889.

Public Health
gift
Henry F. Vaughan
3-14-44

Office of the Secretary of the State Board of Health,
LANSING, MICHIGAN, *October, 1888.*

TO HON. CYRUS G. LUCE, *Governor of Michigan:*

SIR:—In compliance with the laws of this State, I present to you the accompanying Report for the fiscal year ending June 30, 1888.

Very Respectfully,
HENRY B. BAKER,
Secretary of the State Board of Health.

RESOLUTION OF THE BOARD RELATIVE TO PAPERS PUBLISHED IN ITS ANNUAL REPORT.

Resolved, That no papers shall be published in the Annual Report of this Board except such as are ordered or approved for purposes of such publication by a majority of the members of the Board; and that any such paper shall be published over the signature of the writer, who shall be entitled to the credit of its production, as well as responsible for the statements of facts and opinions expressed therein.

CONTENTS.

PAGE.

- Presentation of Report to the Governor ... iii
- Resolution relative to papers in Annual Report ... iv
- Contents ... v-vi
- Members of the Board, Residences, Terms of Office, Standing Committees, etc. ... vii-viii
- Work of the Board, and Work in the Office, Fiscal Year 1888 ... viii-ix
  - Collection and Compilation of Information, Fiscal Year 1888 ... viii-xii
    - Relative to Annual Reports by Health Officers and Clerks of Local Boards of Health. viii-ix
    - Relative to Weekly Reports of Diseases and Health Bulletins ... ix
    - Relative to Return of Names and Addresses of Health Officers of Townships, Cities and Villages ... ix-x
    - Relative to Return of Names of Medical Practitioners ... x-xii
    - Relative to Meteorological Reports ... xii
- Sanitary Survey of Cities and Villages ... xii
- Plans for Model Rural School Houses ... xii-xiii
- Relative to Special Reports ... xiii-xiv
- Dissemination of Information ... xv
- Inter-State Notification of dangerous communicable diseases ... xv-xvii
- Secretary's Report of Property, Additions to Library, etc ... xvii-xxviii
- Expenditures by the Board ... xxix
- Explanation of Expenditures on Account of the Board ... xxix
- Abstracts of Proceedings at Sanitary Conventions ... xxx-xxxii
- Abstracts from Proceedings at Meetings of the Board ... xxxii-xlvii
- Public Health Legislation in Michigan in 1887 ... xxxiv-xxxvii
- The Causation of Consumption ... xxxix
- Abstracts of Secretary's Quarterly Reports ... xlviii-lx
- Principal Meteorological Conditions in 1887 ... 1-77
- Time of Greatest Prevalence of Each Disease in 1887, a Contribution to the Study of the Causes of Diseases ... 79-142
- Relations of certain Meteorological Conditions to Diseases of the Lungs and Air-passages as Shown by Statistical and other evidence ... 143-169
- Report Relative to an Alleged Nuisance ... 170-171
- Examination of Plans for State Public Buildings ... 172-179
  - Plans for a cottage at Northern Asylum for Insane ... 172-176
  - Plans for new Buildings at State School for Girls, Adrian ... 176-178
  - Plans for Northern Prison at Marquette ... 178
  - Plans for Proposed Cottages at Eastern Asylum for the Insane ... 178
  - Plans for Sewer from State Reform School ... 179
- Report of an Investigation of an Outbreak of Typhoid Fever at the State Industrial Home for Girls at Adrian, Mich. ... 179-186
- Report Concerning an Outbreak of Typhoid Fever at the State Prison, Jackson, Michigan ... 186-194
- Tyrotoxicon and other poisonings in Michigan in 1887 ... 194-196
- Injuries alleged to have come from Illuminating Oils in Michigan during the year 1887 ... 196-199
- Dangers from the Use of Gasoline in 1887 ... 200-201
- Document on the Restriction and Prevention of Small-pox ... 202-221

PAGE.
Communicable Diseases in Michigan in 1887 222-283
  Diphtheria in Michigan in 1887 223-239
  Scarlet Fever in Michigan in 1887 239-252
  Typhoid Fever in Michigan in 1887 253-263
  Measles in Michigan in 1887 263-270
  Whooping-cough in Michigan in 1887 271-273
  Small-pox in Michigan in 1887 274-276
  Glanders in Michigan in 1887 276-279
  Hydrophobia in Michigan in 1887 279-280
  Lump-jaw in Cattle in Michigan in 1887 280-281
  Supposed Anthrax in Kent Co., Mich., in 1887 281-282
  Typhus Fever at Quincy, Houghton Co., Mich., in 1887 282-283
Alleged Nuisances in Michigan during the year 1887 283-297

REPORT.

This is the Sixteenth Annual Report of the Secretary of the State Board of Health, and is for the fiscal year ending June 30, 1888. It is arranged and paged in two parts. The first part contains the Secretary's report of work of the Board, the annual report of property, including accessions to the library, with names of donors. The second part contains papers, abstracts, and reports.

To this Report there are supplements containing proceedings and addresses at the sanitary conventions held at Traverse City, Owosso, Albion, and Manistee.

The papers are printed subject to a resolution of the Board, on page iv.

The names and postoffice addresses of the members of the Board, and the dates of the expiration of their terms of office, are as follows:—

VICTOR C. VAUGHAN, M. D., Ph. D., Ann Arbor, Jan. 31, 1889.
C. V. TYLER, M. D, Bay City, Jan. 31, 1889.
HENRY F. LYSTER, A. M., M. D., Detroit, Jan. 31, 1891.
JOHN H. KELLOGG, M. D., Battle Creek, Jan. 31, 1891.
JOHN AVERY, M. D., *President of the Board*, Greenville, Jan. 31, 1893.
ARTHUR HAZLEWOOD, M. D., Grand Rapids, Jan. 31, 1893.
HENRY B. BAKER, M. D., *Secretary of the Board*, Lansing.

The members of the State Board of Health, with the exception of the Secretary. are appointed for the term of six years, and receive no salary for their services.

STANDING COMMITTEES.

1. Epidemic, Endemic and Contagious Diseases.—H. F. Lyster, M. D.
2. Sewerage and Drainage.—H. F. Lyster, M. D.
3. Food, Drinks, and Water-Supply.—V. C. Vaughan, M. D.
4. Buildings, including Ventilation, Heating, etc.—John Avery, M. D.
5. Climate, Geology, Topography, etc.—Henry B. Baker, M. D.
6. Disposal of Excreta.—John H. Kellogg, M. D.
7. Poisons, Explosives, etc.—V. C. Vaughan, M. D.

8. Occupations, Recreations and Habits.—J. H. Kellogg, M. D.
9. Relations of Schools to Health.—John Avery, M. D.
10. Sanitary Survey.—C. V. Tyler, M. D.
11. Vital Statistics.—Henry B. Baker, M. D.
12. Legislation.—C. V. Tyler, M. D.
13. Finances of the Board.—Arthur Hazlewood, M. D.
14. Mental Hygiene.—Arthur Hazlewood, M. D.
15. Animal's Diseases Dangerous to Man.—Henry B. Baker, M. D.
16. Relations of Preventable Sickness to Taxation.—J. H. Kellogg, M. D.
17. Plans for Model School Houses.—Hon. John Avery, M. D., J. H. Kellogg, M. D., and Arthur Hazlewood, M. D.
18. Alcoholic Liquors.—Henry F. Lyster, M. D., Victor C. Vaughan, M. D., and Arthur Hazlewood, M. D.

WORK IN THE OFFICE OF THE BOARD DURING THE FISCAL YEAR ENDING JUNE 30, 1888.

The work of the office naturally groups itself under three closely related heads,—the collection of information, the compilation and elaboration of information, and the dissemination of information. In the following outline that grouping has been made in part only in order to avoid repetition.

COLLECTION AND COMPILATION OF INFORMATION.

ANNUAL REPORTS BY HEALTH OFFICERS FOR THE YEAR ENDING DEC. 31, 1887.

In December, 1887, a circular (127) which had been approved by the Board, was sent to the health officer of each township, city and village in the State, about 1,480 in all, transmitting a blank form [I] for use in making his annual report to this office. This circular was substantially the same as circular 65 which is printed on pages viii-ix of the report for 1884. Blank form I, for reports of health officers, is printed in former reports. The circular (127) also transmitted a blank for a copy of the record of diseases dangerous to the public health, similar to the blank which is printed, reduced in size, on page 271 of the report for 1882.

Where the name of the health officer had not been returned to this office, the blanks were sent to the president of the village, the mayor of the city, or the supervisor of the township, according as the vacancy occurred in a village, city, or township.

ANNUAL REPORTS BY CLERKS OF LOCAL BOARDS OF HEALTH FOR THE YEAR ENDING DEC. 31, 1887.

At the same time (December, 1887) that the circulars and blank forms were sent to the health officers, a circular (126) asking for a report, and a blank form [J] on which to make a report, were sent to the clerk of the local board of health of each township, city and village in the State, about 1,480 in all. A blank form for a copy of his record of cases of diseases dangerous to the public health was also sent; the circular and blank form sent to the clerk were similar to those sent to the health officer, except that they were not so explicit in questions relating to sickness and deaths.

WEEKLY REPORTS OF DISEASES IN 1887.

A list of observers of diseases for the calendar year 1887 and a compilation of their reports, with a study of relations of sickness to climatic conditions is printed in this Report.

HEALTH BULLETINS.

The weekly reports of diseases received up to Wednesday of the week following the week for which they are made, are compiled on that day, week by week, and a bulletin, based on the compilation, is sent for publication to a large number of newspapers, and to sanitary and medical journals. A telegraphic abstract from the compilation is also sent weekly to a Michigan Press Association. A specimen of this weekly health bulletin can be found on page xii of the Report for 1884. Beginning with the month of August, 1884, a monthly health bulletin has been issued immediately after the close of each month, for the use of monthly sanitary and medical journals. A specimen of the monthly bulletin can be found on page ix of the Report for 1885.

NAMES AND ADDRESSES OF HEALTH OFFICERS OF TOWNSHIPS, CITIES AND VILLAGES.

In April, 1888, the usual demand was made upon supervisors of townships, presidents and clerks of villages, and mayors and clerks of cities, for return of the names and postoffice addresses of health officers. The circular and blank forms used are similar to those printed on pages xiii–xiv of the Report for 1884. In June, 1888, a second demand was sent to localities from which no return had been made in response to the demand in April. In August, 1888, a list of the health officers and of their postoffice addresses was printed, when of the 1,496* townships, villages and cities in the State it was found that all but 234 localities were provided with health officers as the law requires. This number, during the following months of August, September and October, was considerably reduced. The number of townships, villages and cities that fail or refuse to comply with the law relative to the appointment of health officers, has on the whole diminished greatly in recent years, which denotes increasing vigilance for the protection of the public health. There is reason to believe that, in a few years, every locality in Michigan will constantly keep a health officer, and thereby save useful lives.

---

* Includes sixteen more than those of which the postoffice addresses were known at this office in preceding December.

As fast as addresses of health officers for 1888 were received, a document detailing the duties of health officers was sent to each, together with blanks for the prompt report of dangerous communicable diseases, and sample copies of the documents on the prevention and restriction of diphtheria, scarlet fever and typhoid fever.

NAMES OF MEDICAL PRACTITIONERS.

In order to facilitate compliance with Act No. 268, Laws of 1887, (which Act amends Act No. 167, Public Acts of 1883) requiring clerks of cities, villages and townships to transmit to the Secretary of the State Board of Health a list of medical practitioners in his jurisdiction, a blank was sent in December, 1887, to the clerk of every township, city and village in the State for such return. Returns were received from 431 clerks, reporting the facts concerning physicians. The following is a copy of the blank (reduced in size):

MEDICAL PRACTITIONERS JANUARY 1, 1888, IN THE .... OF ...., IN .... COUNTY, MICHIGAN.

(Township, city, or village.)

IN COMPLIANCE WITH ACT NO. 167, LAWS OF 1883, AS AMENDED BY ACT NO. 268, LAWS OF 1887.

Names of Practitioners. (Including Registered Students, in which cases the name of Physician with whom practicing should be stated.)	P. O. Address.	Age.	Sex.	Color.	How many years in Practice?	School of Practice.	Name of Medical College Graduated from.	Location of Medical College Graduated from.	When Graduated.

I hereby certify that the foregoing is correct. .... *Clerk.*

In order to facilitate compliance with that part of the law which requires the supervisor at the time of making the annual assessment in each year to make out a list of all physicians practicing within his township, village, ward or city, and to return the same to the township, village or city clerk—a blank similar to that sent in December, 1887, to the clerks, was sent to the supervisor of every township; three were sent to the president of every village and three to the mayor of every city.

METEOROLOGICAL REPORTS.

A list of meteorological observers for the calender year 1887, with a statement of what registers were received from each, is printed in this report. The reports are summarized in an article in this Report on the Principal Meteorological Conditions in Michigan in the year 1887. The data are of great value for the purposes of studying the causes of diseases. The observations made at the office of the Board, at Lansing, have been summarized weekly and a copy kept on file in the office.

SANITARY SURVEY OF CITIES AND VILLAGES.

The circular and blank planned for sanitary survey, by house to house inspections, were sent in May, 1888, to the mayors and health officers of all the cities in Michigan except a few of the largest, and to presidents and health officers of villages. This circular and blank are nearly the same as the circular and blank printed on pages x-xiv of the report for 1887.

PLANS FOR MODEL RURAL SCHOOL HOUSES.

In August, 1887, a circular, prepared by the committee on this subject, was sent to members of the State Board of Education, secretaries of county boards of school examiners, superintendents and principals of graded schools in Michigan, in all to 491 persons asking their coöperation in an effort to place before the people "plans for cheap, neat, well-warmed, well-ventilated, well-lighted and comfortably-seated school houses for rural districts." The following is the circular (reduced in size):

PLANS FOR MODEL RURAL SCHOOL-HOUSES.

The Michigan State Board of Health desires the coöperation of teachers, superintendents of schools, and educators in general, in an effort to place before the people plans for cheap, neat, well-warmed, well-ventilated, well-lighted, and comfortably-seated school-houses for rural districts.

The design is to furnish four or five plans for buildings to range in cost from four hundred to one thousand dollars. The Board, believing this work to be in the interest of public health, have appointed Drs. Avery, Hazlewood and Kellogg a committee to carry out the design.

The committee having full confidence in your experience and ability as a teacher to aid them, earnestly and respectfully ask you to furnish in detail such information upon any or all of the following subjects as your experience may suggest:

1. Location; amount of ground; drainage and sewerage; ornamentation, such as trees, shrubs, vines, flowers, and grass plat or lawn.

2. Location of out-buildings; privies, location and kind; wood and play sheds; play grounds and fencing; location of well or water-supply.

3. The building, its size and arrangement for 30 seats, for 40, for 50, for 60; the number, size, and arrangement of windows of the buildings of each size; cloak-rooms, teacher's room,—size and arrangement of each; teacher's platform and table or desk.

4. Seating of school-room; desks, double or single; arrangement; width of inside and outside aisles.

5. Heating; location, size and arrangement of chimney; location of stove or furnace; kind of stove or furnace.

6. Ventilation; introduction of pure air and removal of foul air, in winter, in summer.

Early replies to any one or more of the above topics will be thankfully received, and proper credit given.

Address, John Avery, M. D., Greenville, Mich.

JOHN AVERY,
A. HAZLEWOOD,
JOHN H. KELLOGG,
Committee.

I cordially approve of and earnestly recommend the inquiries proposed in this circular.

J. ESTABROOK,
Supt. Public Instruction.

FINAL REPORTS OF OUTBREAKS OF DANGEROUS DISEASES.

It was found that the old blank (K) for special final report concerning each outbreak of a disease dangerous to the public health, did not contain questions sufficiently definite concerning methods of disinfection, etc. This blank has been improved from time to time, and the reports are constantly getting more valuable. The blank is now as follows:—

SPECIAL FINAL REPORT RELATIVE TO A COMMUNICABLE DISEASE.

[K.] [Do not fill out and return this until outbreak is over.]

....................P. O.,..................Co., Mich.,
........................188..

To the Secretary of the Michigan State Board of Health, Lansing, Michigan:

1. The disease about which this report is made is.. (Name the Disease.)

2. All the cases included in this report occurred in the...of (Township, city or village.)

..............................County of..................Michigan. (Name of Township, etc.)

3. The source of contagium, and the mode of introduction of the disease into my jurisdiction, were as follows:.. (See remarks concerning this question in the letter.)

..

4. The first case was taken sick................188... (Give date.) The last case was recovered..............188... (Give date.)

5. In this outbreak there have been.............cases in my jurisdiction, of which..............died. (Number.) (Number.)

6. Which of the patients were kept isolated from all other people except nurse and physician?..

7. After the outbreak was over, were *all houses* in which cases occurred in this outbreak disinfected by burning sulphur?.......... Were all the rooms disinfected?.......... The cellars?.......... The garrets?.......... The privies?..........

8. The total amount of sulphur burned in this outbreak was..........lbs., which was about..........lbs per thousand cubic feet of air space.

9. For disinfecting the *contents* of the privy, how much fresh "chloride of lime" was used?..........

10. What other disinfectant and how much was used in the privy-vault?..........

11 Was the privy disinfected by the fumes of burning sulphur?..........

12. How was the clothing, bedding, etc., disinfected?..........

....

13. How were the discharges of the patient disinfected?..........

14. After the outbreak was over, was all the clothing, worn by the nurse and others exposed to infection, disinfected, and how?..........

15. If any deaths in this outbreak, state how the funerals or burials were conducted..........

....

16. Fully describe how you isolated the patient, and other methods you may have taken to restrict the disease. In case of small-pox, please state all facts about vaccinations. ....

....

....

17. What exceptions were there to the complete accomplishment of the foregoing measures and disinfection, after the first person was taken sick? ....

....

18. The evidences of success attending the efforts at restriction were: ....

....

19. The following facts bear on the subject of the period of incubation: ....

....

Very respectfully,

....
(Name.)

....
(Please state whether Health Officer, President or Clerk.)
Of the Board of Health of..........
(Name of city, village or Township.)

When incomplete special final reports have been received, a circular letter asking for a better report has been sent out during the year, of which the following is a copy:

[137.] OFFICE OF THE SECRETARY OF THE STATE BOARD OF HEALTH.
Lansing, Mich........... *188*....

..........,
Health Officer of..........,
....

DEAR SIR:—A special final report relative to the recent outbreak of..........in your jurisdiction has..........been received. Such reports when properly filled out are of great value in determining the best methods for preventing and restricting communicable diseases, but omissions or contradictions in them detract greatly from their value and render their compilation very difficult, if not impossible. If the information is in its proper place on the blank form, its compilation is comparatively easy; but it is difficult and sometimes impossible to compile from letters which have to be read through for each separate point compiled. Therefore a letter will not serve the purposes for which the final report is needed.

In your above-mentioned report, the items which are marked on the enclosed blank are omitted, incomplete or otherwise unsatisfactory. A blank not filled cannot be compiled the same as if filled with a "O," because if left blank, it indicates that the item has been overlooked.

Will you please fill the blanks, making the statements as complete and exact as possible, and return the report to this office?

Very respectfully,
HENRY B. BAKER,
Secretary.

DISSEMINATION OF INFORMATION.

Whenever information is received of the occurrence of diphtheria, scarlet fever; small-pox, or typhoid fever, copies of a document on the restriction and prevention of the disease reported are immediately sent to the health officer, with a request that he distribute them where they will be likely to be read, and it is suggested that the neighbors of those families in which the sickness occurs would be most likely to read them at such times of danger; and it is thought that after reading them they will be most likely to co-operate with the local health officer for the restriction of the diseases. Thousands of pamphlets on each of the most dangerous communicable diseases are distributed by the State Board in this manner—in localities where the disease treated of in the pamphlet is present. They are being distributed in this way all the time, because there is no time when the State is free from scarlet fever or diphtheria, these being among the most important of the dangerous communicable diseases in Michigan. Copies of the documents on diptheria, scarlet fever, and small-pox, in German or in Dutch, are also sent when it is thought they can be used to advantage. Owing to frequent requests for documents in French, Polish, Swedish, and Danish-Norwegian, translations of a leaflet on contagious diseases [47] have been made into each of these languages; and copies are sent to local boards when so requested.

A record is kept of reports received and of correspondence relative to each outbreak of a dangerous communicable disease of which the office receives information.

INTER-STATE NOTIFICATION OF DANGEROUS COMMUNICABLE DISEASES.

In April, 1888, a blank form was printed for use in notifying neighboring State boards of health of the outbreak of small-pox, or other dangerous communicable disease. This action was taken in accordance with resolutions passed by the National Conference of State Boards of Health at Toronto, and at Washington, D C. The blank form and resolutions printed herewith (reduced in size)are self-explanatory.

INTER-STATE NOTIFICATION OF DANGEROUS COMMUNICABLE DISEASES.

[183.] MICHIGAN STATE BOARD OF HEALTH, OFFICE OF THE SECRETARY,
Lansing, Michigan,............................*18*......

To..
....
....

DEAR SIR:

In compliance with the Resolutions adopted by the National Conference of State and Provincial Boards of Health at Toronto, 1886, and Washington, 1887, printed on the back of this sheet, it becomes my duty to inform you that....................case....of....................................

exist....at......................................in the County of....................................

in the State of Michigan.

The person sick..

....

(Resident, traveler or immigrant)...

The origin of the disease is...

....

....

The measures taken to restrict are...

....

....

....

The danger of the disease spreading is...

....

....

Very Respectfully,

....

Secretary.

The following are the resolutions adopted by the National Conference of State and Provincial Boards of Health, at Toronto, October 6, 1886:

(*Also presented to and adopted by the American Public Health Association, October 8, 1886.*)

WHEREAS, It is necessary for the protection and preservation of the public health that prompt information should be given of the existence of cholera, yellow fever and small-pox; be it

1. *Resolved*, That it is the sense of the National Conference of State Boards of Health, that it is the duty of each State, Provincial and Local Board of Health in any locality in which said diseases may at any time occur, to furnish immediately information of the existence of such disease to Boards of Health of neighboring States and Provinces, and to the Local Board in such States as have no State Board.

2. *Resolved*, That upon rumor or report of the existence of pestilential disease, and positive definite information thereon not being obtainable from the proper health authorities, this Conference recommends that the health officials of one State shall be privileged and justified to go into another State for the purpose of investigating and establishing the truth or falsity of such reports.

3. *Resolved*, That wherever practicable, the investigations made under the preceding section shall be done with the co-operation of the State and local health authorities.

4. *Resolved*, That any case which presents symptoms seriously suspicious of any of the aforenamed diseases, shall be treated as suspicious, and reported as provided for in cases announced as actual.

5. *Resolved*, That any case respecting which reputable and experienced physicians disagree as to whether the disease is or is not pestilential, shall be reported as suspicious.

6. *Resolved*, That any case respecting which efforts are made to conceal its existence, full history and true nature, shall be deemed suspicious, and so acted upon.

7. *Resolved*, That in accordance with the provisions of the foregoing resolutions, the Boards of Health of the United States and Canada, represented at this Conference, do pledge themselves to an interchange of information as herein provided.

At the National Conference of State and Provincial Boards of Health, at Washington, D. C., September, 1887, the following resolutions were adopted:

1. *Resolved*, That the Conference reaffirms the principles contained in the resolutions adopted by it at its meeting in Toronto in 1886.

2. That the communicable diseases hereinafter mentioned, prevalent in certain areas or which tend to spread along certain lines of travel, be reported to all State and Provincial Boards within said area or along said lines of communication

3. That in the instance of small-pox, cholera, yellow fever and typhus, reports be at once forwarded, either by mail or telegraph, as the urgency of the case may demand; and further, that in the instance of diphtheria, scarlatina, typhoid fever, anthrax or glanders, weekly reports, when possible, be supplied, in which shall be indicated, as far as known, the places implicated and the degree of prevalence.

"The report having been read it was voted that the vote, on its adoption, be taken by States. The vote being so taken was unanimous in its favor by all the States and Provinces represented by delegates present."

REPORT OF THE SECRETARY RELATIVE TO PROPERTY, ETC., FOR THE FISCAL YEAR (NINE MONTHS) ENDING JUNE 30, 1888.

To the President and Members of the Michigan State Board of Health:

GENTLEMEN:—In compliance with Section 5 of Article II. of the by-laws of this Board, the following report of the " Nature and amount of property belonging to the Board, which has been received, issued, expended and destroyed since the last report, and of the property remaining on hand, and also in whose care each item of property is intrusted," is respectfully submitted:

My last report is printed on pages xxi.—xxxvi., of the Annual Report for the year 1887.

INSTRUMENTS PURCHASED.

Since last report, instruments have been purchased as follows:

One Draper's self-registering thermometer; one 8-inch triangle; one curve ruler; one dotting and spacing machine; one parallel ruler.

METEOROLOGICAL INSTRUMENTS.

Meteorological instruments have been intrusted to observers as follows:—

One maximum thermometer to Lieut. A. H. Boies, Hillsdale.

One standard thermometer and one wet bulb thermometer in use, in instrument shelter, for the office of this Board.

The psychrometer, set of registering thermometers and rain gauge, entrusted to Frank E. Wood, Ripley, Portage Lake, L. S., were returned Nov. 23, 1887.

The psychrometer, set of registering thermometers and rain gauge, entrusted to J. B. Grant, Bay Port, were returned April 25, 1888.

Meteorological instruments remaining in office of the Board June 30, 1888:—

One standard thermometer.
Three sets registering thermometers.
Three minimum thermometers.
Eleven psychrometers complete.
One psychrometer cup.
Four dry bulb thermometers.
Two wet bulb thermometers.
Three registering thermometer boards.
Five registering thermometer clips.
Two psychrometer clips.
Four standard barometers.
Six barometer boxes.
Four rain gauges with overflow tubes.
One basin to rain gauge.
One rain guage, leaky.
Three caps to overflow tubes to rain gauges.
Three measuring sticks to rain gauges.
Five screw bolts and five pins to reg. thermometer boards.
One worn out anemometer spindle.
Three anemometer cups, rusted and spoiled by long exposure.
One 8-inch triangle; one curve ruler; one dotting and spacing machine; one parallel ruler.
One Draper's self-registering thermometer.

ACCESSIONS TO THE LIBRARY.

Books and other publications have been received and placed in the library of the Board (during the fiscal year ending June 30, 1888) as follows:—

BY PURCHASE:

Ventilation and Warming of School Buildings—Gilbert B. Morrison.

Medical Times, London, Eng.

Dictionary of the German and English languages—G. F. Adler, A. M.

Spiers' and Surenne's French and English Pronouncing Dictionary—A. Spiers.

The Wife's Handbook—H. Arthur Albutt, M. R. C. P. E., L. S. A.

Pathology of Bronchitis—Dr. J. Hamilton, M. B., F. R. C. S. E., F. R. S. E.

Climatic Treatment of Consumption—J. A. Lindsay, M. A., M. D.

International Scientist's Directory—Samuel E. Cassino.

Health of Nations, a Review of the Works of Edwin Chadwick, Vols. I and II—B. W. Richardson.

Memorials of a Half Century—Bela Hubbard.

Transactions of the Epidemiological Society of London, Vol. VI, Session 1886-87.—Epidemiological Society.

Comparative Morphology and Biology of the Fungi Mycetozoa and Bacteria—A. De Bary (translated by Henry E. F. Garnsey, M. A.).

Transactions of the Sanitary Institute of Great Britain, Vols. VII, 1885-86; VIII, 1886-87—Edward Stanford.

Tagblatt des VI Internationalen Congresses für Hygiene und Demographic zu Wien, 1887, with sup.

Arbeiten der Hygienischen Sectionen. No. VI, VII, XXIV, XXVI, XXIX.

List of members.—Katalog No. XXXII, XXXIII. Katalog Sup. No. XXXII, XXXIII. Programme für die Excursionen, etc.

American Meteorological Journal.

American Journal of Medical Sciences.

Lancet, American.

British Med. Journal.

Official Postal Guide.

Lancet, London.

Nature.

Popular Science Monthly.

Practitioner, London.

Sanitary Record.

Sanitarian.

Sanitary Engineer.

Sanitary Journal.

Scientific American.

Scientific American Supplement.

Science.

Archiv für Hygiene.

Berliner Klinische Wochenschrift.

Comptes Rendus.

Revue d'Hygiene.

Centralblatt für Allgemeine Gesundheitspflege.

Centralblatt für Bakteriologie und Parasitenkunde.

BY GIFT, EXCHANGE, ETC. (*Names and Addresses of donors being printed in Italics.*)—

Abbott, Sam'l W., M. D., Boston, Mass.:—

Forty-fifth Registration Rep. of Massachusetts.

Nineteenth Ann. Rep. of Mass. State B'd of Health.

Arai, J., Tokio, Japan:—

Report of an Expedition to Mount Fugi.

Ann. Met. Rep. for the year 1886.

Quarterly Rep. of the Tokio Library, July to Sept., 1887.

Report of the Met. Obs, for ten years, 1876-1885, at the Imp. Met. Observatory, Tokio, Japan.

Monthly Summaries and Monthly Means for the years 1884, 1885, 1886.

Monthly and Yearly Means and Sums for the years 1883, 1884, 1885.

Ashmun, G. C., Cleveland, Ohio:—

Fifteenth Ann. Rep. of Health Dept. of the City of Cleveland, year ending Dec. 31, 1887.

Bailey, M. D., Steele, Stamford, Ky.:—

Minutes of the Thirty-second Ann. Rep. of Ky. State Med. Soc.

Baker, M. D., Henry B., Lansing, Mich.:—

Scientific Investigation of Disease.—Baker.

Tables, Relation of Intermittent Fever to Atmospheric Temperature.

Diagrams, Relation of Intermittent Fever to Atmos. Temperature.

National and International Sanitary Jurisprudence.—T. J. Turner, M. D.

Registration of Disease.—Baker. Extract from Wm. Wood & Co.'s Reference Handbook of the Med. Sciences.

Causation of Pneumonia.—Baker.

Baker, Dr., Julian M., Tarborough:—

Trans. of Thirty-fourth Ann. Session of the Med. Soc. of N. C.

Balch, M. D., Lewis, Albany, N. Y.:—

Seventh Ann. Rep. of N. Y. State B'd of Health.

Barger, M. D., San Francisco, Cal.:—

Ann. Rep. of Supt. Physician of City and County Hospital, San Francisco.

Barwick, Sergeant James A., Sacramento, Cal.:—

Ann. Met. Review, etc., for 1887.

Bayard, Hon. T. F., Washington, D. C.:—

Reports from the Consuls of the U. S., Nos. 83, 84, Sept., 1887.

Statistical Abstract for Foreign Countries for each year, 1873 to 1885.

Quarantine Laws of the U. S. (State and Nat'l.)

Bayles, James C., New York:—

Tenement House Problem of N. Y.—James C. Bayles.

Becker, Dr.'K., Berlin, Germany:—

Statistisches Jahrbuch für das Deutsche Reich, 1887.

Bidenkap, Dr., Christiana, Norway:—

Beretning om Folkemaengden og Sundhedstiltanden i Christiana i Aaret 1886.

Billings, Frank S., Lincoln, Neb.:—

First Rep. from the Patho-Biological Laboratory, University of Nebraska.

Billings, John S., Washington, D. C.:—

Index Catalogue of the Lib. of the Surg. General's Office, U. S. A., Vol. VIII., L. to M.

Board of Health, Hartford, Conn.:—

Third Ann. Rep. of the B'd of Health, City of Hartford.

Board of Health of Reading, Pa.:—

Report of the B'd of Health of the City of Reading for 1887.

Board of Education of Detroit·—

Official Rep. of Regular meeting of B'd of Education of Detroit.

Böhmert, Dr., Dresden, Saxony:—

Kalender und Statisches Jahrbuch für das Königreich Sachsen 1888.

Statistiche Mittheilungen uber die Grundstücken-zuzammenlegungen, etc.

Booker, F., Coventry, England:—

Thirteenth Ann. Rep. of the Med. Officer of Health, Coventry.

Bolles, Albert S., Harrisburg, Pa.:

Ann. Rep. of the Bureau of Industrial Statistics of Pa., 1886.

Bureau of Education, Washington, D. C.:—

The Study of History in American Colleges and Universities—Herbert B. Adams.

Burgerstein, Dr. Leo, Vienna, Austria:—

Der Schularzt.

Die Schulgesundheitspflege auf dem Wiener Kongresse für Hygiene, etc.

Burrows, Hon. Acton, Winnipeg, Man.:—

Statutes of the Province of Manitoba, Vol. 1, 1887.

Burrows, J. G., Melbourne, Australia:—

Twelfth Ann. Rep. of the Australian Health Society.

Canniff, W., Toronto, Ont.:—

Ann. Rep. of Local B'd of Health of Toronto, for 1887.

Carter, A. R, Baltimore, Md.:—

Ann. Rep. of Health Dept., Baltimore, 1887.

Chancellor, M. D., C. W., Baltimore, Md.:—

Seventh Biennial Rep. of Maryland State B'd of Health.

Christie, W. H. M., M. A., T. R. S., Greenwich, Eng.:—

Greenwich Magnetical and Meteorological Observations, 1885.

Cohn, Dr. Ferdinand, Breslan, Germany:—

Malarial Germs—Schiavuzzi, Sonderabdruck aus Beiträge zur Biologie der Pflanzen.

Coleman, Norman, Jr., Washington, D. C.:—

Record of experiments in the manufacture of sugar from sorghum and sugar canes, etc.

Foods and Food Adulterants.—Commissioner of Agriculture.

Collamore, M. D., G. A., Toledo, Ohio:—

Ann. Rep. of Toledo B'd of Health, 1887.

Commissioner of Railroads, Lansing, Mich.:—

Fifteenth Ann. Rep. of Com. of Railroads, 1887.

Commissioner of Agriculture, Washington, D. C.:—

Report of the condition of winter grain, cotton, etc., May, 1887.

Report of yield of crops, etc.

Committee dell Associazione Meteorologica Italiana, Torino:—

Bolletino Mensuale Dell 'Observatorio Centrale del Real Collegio Carlo Alberto, Settembre, 1887.

Conn, Dr. G. P., Concord, N. H.:—

Transactions of N. H. Med. Soc., Ninety-seventh Ann. Session.

Reports of B'd of Health, City Physician and Health Officers of Concord, 1887.

Cook, M. D., W. C., Nashville, Tenn.:—

Necessity for teaching Hygiene in Schools.

Cook, Geo. H., New Brunswick, N. J.:—

Ann. Rep. of the State Geologist of N. J. for 1887.

Cross, Samuel H., Westerly, R. I.:

Nineteenth Ann. Rep. of the B'd of State Charities and Corrections of R. I.

Department of State, Washington, D. C.:—

Quarterly Rep. of Chief of Bureau of Statistics.

Reports from Consuls of the United States, 1887, 3 vols.

Department of Health, Buffalo, N.Y.:—

Ann. Rep. of the Dept. of Health and Vital Statistics of Buffalo, N. Y.

De Pietra Santa Dr., P. Paris:—

Les Stations d'eaux minerales du centre de la France.

Direccion General de Beneficencia y Sanidad, Madrid:—

C'olera Morbo Asiatico en Espana durante el Anno de, 1885.

Director of Kew Observatory, Richmond, Eng.:—

Report of the Kew Com., year ending, Oct. 31, 1887.

Direzione Generale della Statistica, Rome, Italy:—

Statistica, delle opere pie ál 31, Dicembre, 1880, e dei lasciti di Beneficenza fatti Nel quinquennio 1881-85. Statistica Guidiziaria Penale per L' Anno, 1885.

Durell, M.D., Thos. M., Somerville, Mass:—

Tenth Ann. Rep. of the B'd of Health of Somerville, 1887.

Eastwood, A.M., J. F.:—

Organic contamination of soils.—Eastwood.

Edge, Thos. J., Hamburg, Pa.:—

Eleventh Ann. Rep. of Pennsylvania State B'd of Agriculture.

Failyer, G. H., Manhattan, Kansas:—

Trans. of eighteenth and nineteenth Ann. Meetings of the Kansas Academy of Science.

Farnam, H. W., New Haven, Conn.:—

Report of Com. on advisability of establishing a Town Workhouse, etc.

Feegneoux, Dr. A., Bruxelles:—

Bulletin de la Sociéte Royale de Medicine Publique de Belgique.

Fisher, M. D., Charles H., Providence, R. I.:—

Thirty-fourth Rep. upon Births, Marriages and Deaths in the State of R. I., Year ending Dec., 1886.

Ford, Worthington C., Washington, D. C.:—

Index to the Consular Reports Nos. 1 to 59 (1880-1885).

Foster, William E., Providence, R. I.:

Tenth Ann. Rep. of the Library of Providence Pub. Library.

Fuller & Warren Company, Chicago, Ill.:

"The Ultimate of Sanitation."

Garfield, Hon. Charles, Grand Rapids:—

History of Michigan Horticulture.—Garfield.

Gerhard, Wm. Paul, Newport, R. I.:

Drainage of a house.—Gerhard.

Gold, T. S., West Cornwall, Conn.:

Report of Conn. B'd of Agriculture and Experimental Station.

Goss, Francis Webster, Boston, Mass.:

Triennial Catalogue and Directory of the Mass. Medical Soc.

Medical Communications of the Mass. Med. Soc., Vol. XIV.

Greeley, Gen. A. W., Washington, D. C.:

Extract No. 26, from Ann. Rep. of Chief Signal Officer for 1886.

Hamilton, M. D., John B., Washington, D. C.:—

Weekly abstract of Sanitary Reports.

Ann. Rep. of the Supervising Surgeon-General of the Marine Hospital Service of the U. S., for 1887.

Hardy, M. H., Provo, Utah:—

Preventable Disease.—Utah County B'd of Health.

Hargis, M. D., Robert B., Pensacola, Florida:—

The Natural History of Plagues.—Hargis.

Hazen, H. A., Washington, D. C.:—

Extract No. 25 from Ann. Rep. of the Chief Signal Off. U. S. A., for 1886.

Heath, A. H., Lansing, Mich.:—

Fifth Ann. Rep. of Bureau of Labor and Industrial Statistics.

Hinrichs, Dr. Gustavus, Iowa City, Iowa:—

Re-election or Re-organization.—Hinrichs.

Hitchcock, Dr. E., Amherst, Mass.:—

The Anthropometric Manual of Amherst College, 1887.

Holt, M. D., Jos., New Orleans, La:—

Excerpt from Biennial Rep. of B'd of Health of the Gen. Assembly of the State of Louisiana, 1886-87.

The Quarantine System of Louisiana, etc.

Hyatt Pure Water Co., New York:—

Hyatt pure water system.

Letter from acting Sec'y of War, etc.

Janssens, Dr. E., Bruxelles:—

Annuaire Demographique et Tableaux Statistiques des causes de Décés, ville de Bruxelles.

Rapport fait au Conseil Commercial en Séance du 3 Octobre, 1887.

Jones, M. D., H. M., Cincinnati, O.:—

Twenty-seventh Ann. Rep. of Cincinnati Hospital.

Jones, M. D., Talbert, Saint Paul, Minn.:—

Ann. Rep. of the Dept. of Health; city of Saint Paul, 1887.

Kennedy, M. D., J. F., Des Moines, Iowa:—

Fourth Biennial Rep. of Iowa State B'd of Health.

Laberge, Dr. Louis, Montreal:—

Rep. on the Sanitary State of Montreal, 1886.

Lawes and Gilbert, Rothamsted, England:—

Memoranda of the origin, plan and results of field and other experiments conducted on the farm and in the laboratory of Sir John B. Lawes, June, 1887.

Lawrence, Henry N., Lansing, Mich.:—

Extracts from the works of Lord Bacon, etc.

Lee, M. D., Benjamin, Philadelphia, Pa.:—

Proceedings of State San. Convention, at Phil. May 12, 13, 14: 1886.

Circular No. 26, School Hygiene, addressed to, teachers.—State B'd of Health.

Commonwealth of Pa., State B'd of Health, Sup. to the Model Ordinance for the better preservation of Pub. Health, etc. (Circula- No. 25.)

Constitution, By-laws and Regulations of State B'd of Health and Vital Statistics.

Lee, William H., Wilmington, Del.:—

Reports of Pres., Sec'y and Treasurer of B'd of Health of the City of Wilmington.

Lindsley, M. D., C. A., New Haven, Conn.:

Small Pox, Restriction and Prevention.—Conn. State B'd of Health.

Tenth Ann. Rep. of State B'd of Health of Conn.

Longyear, M. D., H. W.:—

24th Ann. Rep. of the Pres. of Harper Hospital.

Maltz, Geo. L., Lansing, Mich.:—

Report of the State Treasurer, State of Mich., 1887.

Mansfelde, A. S. V., Ashland, Neb.:

Proceedings of Neb. State Med. Soc., 1886-7.

McKee, Dr., Cincinnati, Ohio:—

On my treatment of Fibroid Tumors of the Uterus by Electricity, etc.

On a new treatment, by Electricity, of Peri-Uterine Inflammation.—Dr. G. Apostole.

Mead, M. D., J. M., Iron Mountain, Mich.:—

Notice to Householders.—J. M. Mead.

Medical Officer, Local Gov't Board, London, England:—

Sixteenth Ann. Rep. of the Local Gov't B'd, 1886-87.

Supplement containing Rep. of Med. Officer for 1886.

Mich. State B'd of Health, Lansing, Mich.:—

Abstract of Proceedings of Mich. State B'd of Health, Regular Meet'g, April 10, 1888.

Fourteenth Ann. Rep. of the Sec'y, year ending Sept. 3, 1886.

Prevention of Communicable Diseases.—John Avery, M. D

Abstract of Proceedings of Mich. State B'd of Health, Regular Meet'g, Oct. 11, 1887.

Injuries from Illuminating Oils in Mich, in 1887.—Sec. S. B. of H.

Proceedings of Nat. Conference of State B'ds of Health, held at Washington, D. C., Sept. 7, 1887.

First quarterly rep. of Mich. State Laboratory of Hygiene.

Dangers in Gasoline.—John H. Kellogg, M. D.

Communicable Diseases in Mich. in 1886.

Money value of Sanitary Work.—T. T. Bates.

The Sewerage of Traverse City: Its Necessity and Practicability.—Geo. E. Steele.

Causes and Prevention of Insanity.—J. D. Munson, M. D.

The Drink Problem.—Henry F. Lyster, M. D.

Money value of Sanitary Work, by A. A. Clark.

Proceedings of the San. Con. at Traverse City.

Mills, Charles F., Springfield, Ill.:—

Statistical Rep. of Ill. State B'd of Agriculture, Dec., 1887.

Monthly Weather Review, Jan. and Feb., 1888, and Crop prospects.

Ministero di Agricultura e Commercio, Roma, Italy:—

Bilanci Provinciali per L'Anno, 1885.

Ministero di Agricultura, Industria et Commercio, Rome, Italy:—

Annuali Di Statistica.

Statistica della operie pie al 31 Decembre, 1880, e Dei Lasciti.

Beneficenza fatti nel quinquenie 1881-1885.

Bilanci Communali per l'anno, 1885.

Statistica delle cause di Morte nei Comuni Capoluoghi di Provincia e di Circundario, e delle Morti violente avvenute in tutto il Regno. Anno 1885.

Ministerio de la Gobernacion, Madrid, Spain:—

Estadistica de los Delitos y Faltas Comitidos y Capturas de Criminales.

Montizambert F., M. D., F. R. C. S., Grosse Isle, Quebec:—

Quarantine Ann. Rep. of Grosse Isle Station.

Nelson, Theodore, St. Louis, Mich.:—

Rep. of the Supt. of Pub. Instruction, Mich., 1886.

Newton, William K., Paterson, N. J.:—

Rep. of the Dairy Commissioner, State of N. J.

Nicholson, H. H., Lincoln, Neb.:—

Ann. Rep. of Neb. State B'd of Agriculture, 1886.

Nipher, Francis E., St. Louis, Mo.:—

The Volt, the Ohm and the Ampere.—Nipher.

North, S. W., York, England.:—

Rep. on the Compulsory Notification of Infectious Diseases, etc.

Orton, Edward, Columbia, Ohio:—

Geological Survey of Ohio.

Osmun, G. R., Lansing, Mich.:—

Live Stock Sanitary Laws of the State of Mich.

Palmer, Hon. T. W., Washington, D. C.:—

Restriction of Immigration. Speech by Hon. T. W. Palmer in the Senate of the U. S. Jan. 24, 1888.

Statements made before the Com. on Agriculture and Forestry of the U. S., upon bill (S. No. 945).

Statements of Messrs. Ames and Bowman.

A bill to provide for the establishment of a bureau of Animal Industry.

Palmberg, Dr. Albert, Wiborg, Finland:—

Recherches du Dr. Elie Metschnikoff sur la lutte de certaines cellules dans l'organisme contre les microbes.

Continuation de la discussion sur le traitement preventif de la rage d'après la methode Pasteur.

Parkhill, Stanley E., Owosso:—

Proceedings of Michigan Pharmaceutical Association.

Peck, M. D., O. W., Oneonta, N. Y.:—

Rural Sanitation.—O. W. Peck, M. D.

Probst, C. O., M. D., Columbus, Ohio:—

Manual of the Health Laws of the State of Ohio.

Rauch, M. D., John H, Chicago, Ill.:—

Rep. of Proceedings of Ill. State B'd of Health.

Redden, M. D., J. W., Topeka, Kan.:—

Third Ann. Rep. Kan. State B'd of Health, 1887.

Reed, Harvey R., Mansfield, Ohio:—

Heating and Ventilation of Passenger Coaches.

Rep. on the Sanitary Inspection of Passenger Coaches.

Reeve, M. D., J. T., Appleton, Wis.:—

Eleventh Rep. of Wis. State B'd of Health, 1887.

Prevention of Sickness, etc.—Wis. State B'd of Health.

Registrar Gen., Toronto, Ont.:—

Rep. relating to Registration of Births, Marriages and Deaths in the Prov. of Ont., 1886.

Royal Meteorological Society, England:—

List of Fellows of the Roy. Met. Soc.

Russell, James B., B. A., M. D., Glasgow:—

On some Sociological Aspects of Sanitation.—Russell.

Schiavuzzi, Dr., Bernardo, Istria, Austria:—

Istruzione popolare sulla Malaria.—Schiavuzzi.

Schreiber, Dr. Paul, Chemnitz, Saxony:—

Jahrbuch des Konigl. sächs. meteorologischen Institutes, 1886.

Jahrbuch des Konigl. sachsischen meteorologischen Institutes. III, Abtheilung des Jahrganges IV., 1886. Berichtüber die Thätigkeit im meteorologischen Institute für das Jahr 1887.

Secretary of State, Lansing, Mich.:—

Local Acts, Mich., Session 1887.

Pub. Acts, and Joint and Concurrent Resolutions of the Mich. State Legislature, Regular Session of 1887.

Mich. Crop Rep., April 1, 1888.

Secretary of Mich. State Horticultural Society:—

Seventeenth Ann. Rep. of Sec'y Mich. State Hor. Soc.

Secretary of State, Washington, D. C.:—

Bimetallism in Europe.

Technical Education in Europe, etc.—J. Shornhof.

Budgets and Budget Legislation in Foreign Countries.

Secretary of Ill. State B'd of Health, Springfield, Ill.:—

Rep. of Proceedings of Ill. State B'd of Health, Ann. Meet'g, Jan. 12-13, 1888.

Secretary S. C., State B'd of Health, Charleston, S. C.:—

Eighth Annual Rep., S. C. State B'd of Health.

Secretary State B'd of Health of Delaware, Wilmington, Del.:—

Laws of Delaware for the Preservation of the Pub. Health, and Registration of Vital Statistics.

Secretary New Jersey State B'd of Health, Trenton, N. J.:—

Eleventh Ann. Rep. of N. J. State B'd of Health.

Secretary Maine State B'd of Health, Augusta, Maine:—

Scarlet Fever, Its Prevention and Restriction.— Maine State B'd of Health.

Diphtheria, Its Prevention and Restriction.— Maine State B'd of Health.

Sheffield, William P.:—

One hundred and fifty-seventh Ann. Rep. of Directors of Redwood Library and Atheneum.

Simpson, M. D., W. J., Calcutta, India:—

Rep. on the Vital Statistics of Calcutta, India, 4th quarter of 1887.

Rep. of the Health Officer of Calcutta, India.

Smith, Charles D., M. D., Portland, Maine:—

Transactions of the Maine Med. Assoc., 1887.

Third Ann. Rep. of City of Portland B'd of Health.

Smith, M. D., Wm. M., Syracuse, N. Y.:—

Officers and Members of the Med. Soc. of the State of N. Y., also of County Med. Societies, for 1885.

Transactions of N. Y. State Med. Soc., for 1885.

Ann. Rep. of the Commissioners of Quarantine of the State of N. Y.

Snow, M. D., Edwin M., Providence, R. I.:—

Fifth Ann. Rep. of Supt. of Health, City of Providence.

Societa Meteorologica Italiana, Torino:—

Bollettino Mensuale Delle osservatorio Centrale del Real Collegio Carlo Alberto, Vols. V, VI, 1885, 1886.

State Historical Society, Topeka, Kansas:—

Fifth Biennial Rep. of the B'd of Directors of Kan. State His. Soc.

Statisisches Amt, Berlin:—

Statistische Mittheilungen über den Civilstand der Stadt Frankfurt am Main im Jahre 1887.

Veröffentlichungen des Statistischen Amts der Stadt Berlin, Sup. I.

Stearns, M. D., Henry P., Hartford, Conn.:—

Sixty-fourth Ann. Rep. of the officers of the Retreat for the Insane at Hartford, April, 1888.

Storrs, Lucius C., Lansing, Mich.:—

Proceedings of Sixth Ann. Conf. of Assoc. of County Agents, and Con. of B'd of Cor. and Charities.

Proceedings of Nat. Conf. of Charities and Corrections at the Fourteenth Ann. Session in Omaha, Neb., Aug. 25-31, 1887.

Stratton, T. E., M. D., Richmond, Va.:—

Ann. Rep. of Health Dept. of the City of Richmond, 1887.

Surgeon-General of the Army, Washington, D. C.:—

Rep. of Surgeon-General of the Army, year ending June 30, 1887.

Swift, Geo. B., Chicago, Ill.:—

Twelfth Ann. Rep. of the Dept. of Pub. Works to the City Council of Chicago for the year 1887.

Switzler, Wm. F., Washington, D. C.:—

Internal Commerce of the United States.—Switzler.

Taggart, Moses, Lansing, Mich.:—

Ann. Rep. of the Att. Gen. of the State of Mich.

Taneyhill, M. D., G. L., Baltimore, Md.:—

Trans. of the Med. and Chir. Faculty of Md., 89th Ann. Session, April, 1887.

Tatham, John, B. A., M. D., Salford, Eng.:—

Ann. Rep. of the Med. Officer of Health, Borough of Salford, for 1886.

Treasury Department, Washington, D. C.:—

Quarterly Rep. of Chief of Bureau of Statistics for the three months ending June 30, 1887.

Rep. of Chief of Bureau of Statistics, for the four quarters ending June 30, 1887.

Quarterly Rep. relative to Imports, etc., for the three months ending Sept. 30, 1887.

Unknown Donor:—

Republic of Mexico. Paper Bd. Book.

Vermont State B'd of Health:—

Prevention and Restriction of Diphtheria. Vermont State B'd of Health.

Regulations promulgated by Vermont State B'd Health.

Thirtieth Rep. to the Legislature of Vermont, year ending Dec. 31, 1886.

Victoria St. Society, Westminster, England:—

M. Pasteur's Hecatomb. A tale of the 122 dead. Corrected to Nov. 1, 1887.

Watanabe, H., Tokio, Japan:—

Calendar for 1887-88.

Watson, Irving A., M.D., Concord, N. H.:—

Sixth Ann. Rep. relating to Births, Marriages Divorces and Deaths in N. H., 1885.

Sixth Ann. Rep of N. H. State B'd of Health.

Wheeler, J. J., East Saginaw, Mich.:—

Water Commissioners' Rep. on Water Supply, etc.

Wright, Carroll D., Washington, D. C.:—

Eighteenth Ann. Rep. of the Bur. of Statistics of Labor.

ACCESSIONS, BY EXCHANGE.

In exchange for publications of this Board, the following periodicals have been received (in some instances incomplete volumes):—

American Exchange and Review, Philadelphia.
American Monthly Microscopical Journal.
American Analyst, New York.
American Grocer.
American Practitioner and News, Louisville.
Annals of Hygiene, Philadelphia.
American Pharmacist, Detroit.
Anti-Adulteration Journal, Philadelphia.
Agricultural College Bulletin, Lansing, Mich.
Bulletin Mississippi Weather Service.
Bulletin New England Meterological Society.
Bulletin N. C. State Board of Health.
Bulletin Tenn. State Board of Health.
Bulletin de la Societé des Crechés.
Bulletin Hebdomadaire de Statistique Demographie et Medical, Havre.
Bulletin de L'Acadamie Royale de Médecine d Belgique.
Bulletin Mensuel du Bureau de Demographie, Marseilles.

Boletin Mensuel, Madrid, Spain.
Bulletino Mensuale, Italiana.
Buffalo Medical and Surgical Journal.
Building, New York.
Canada Lancet, Toronto.
Canada Medical and Surgical Journal.
Canadian Practitioner, Toronto.
Chicago Medical Journal and Examiner.
Cincinnati Lancet and Clinic.
College and Clinical Record, Philadelphia.
Columbus Medical Journal, Columbus, Ohio.
Calcutta Health Officer's Quarterly Report.
Druggists' Circular, New York.
Daniels' Medical Journal.
Ephermeris, Squibbs, Brooklyn, N. Y.
Good Health, Battle Creek.
Herald of Health, New York.
Hygiene Pratique, Paris, France.
Indiana Weather Service Monthly Bulletin.
Indicator, Detroit.
Italian Meteorological Society Monthly Bulletin.
Journal of American Medical Association, Chicago.
Journal of Franklin Institute.
Journal D'Hygiene, Paris, France.
Journal of Reconstructives.
Leonard's Illustrated Medical Journal.
Maryland Medical Journal.
Manufacturer and Builder, New York.
Manadsofversight af Vanderleken i Sverige.
Medical Standard.
Medical Age, Detroit.
Medical Bulletin, Philadelphia.
Medical News, Philadelphia.
Medical Counselor, Detroit.
Medical Science.
Metal Worker, New York.
Microscopical Bulletin, Philadelphia.
Michigan Dairyman.
Michigan Crop Report.
Minnesota State Weather Service and Crop Report.
Ministerio De La Gobernacion Bolleton De Sanidad.
Ministero Dell Interno Direzione Della Sanita Publica.
Mississippi Valley Medical Monthly.
Monthly Bulletin, Iowa Board of Health.
Monatshefte zur Statistik des Deutschen Reichs.
Modern Crematist, Lancaster, Pa.
National Druggist, St. Louis.
Nashville Journal of Medicine and Surgery.
Nashville Monthly Meteorological Summary.
Nebraska Weather Bulletin and Crop Report.
New York Medical Abstract.
New York Medical Journal.
North Carolina Medical Journal, Wilmington, N. C.
Northwestern Lancet, St. Paul, Minn.
Ontario Monthly Health Bulletin, Toronto.
Pharmaceutical Era, Detroit.
Philadelphia Medical Times.
Physician and Surgeon, Ann Arbor.
Public Health in Minnesota.
Quarterly Journal of Royal Meteorological Society, England.
Sanitary News, Chicago.
Sanitary Era, New York.
Sanitary Inspector.
Salford Health Bulletin, Salford, England.
Statistical Report, Illinois State Board of Agriculture.
St. Louis Medical Journal.
Swiss Cross, New York.
Tablettes Mensuelles, Bellgique, Brussels.
Therapeutic Gazette, Philadelphia.
The Microscope.
Vaccination Inquirer, London, England.
Veröffentlichungen des Kaiserlich Deutschen Gesund.
Veroffentlich. des Statistischen Amts der Stadt, Berlin.
Weather Review, monthly, Washington, D. C.
Weather Chronicle, New Jersey.
Weekly Medical Review, Chicago.
Weekly Returns of Births and Deaths in Dublin, Ireland.
West American Scientist, San Diego, Cal.
Zeitschrift des K. Sächs. Stat. Bureau.

Excepting certain publications drawn out by members of the Board and others, as specified in this Report, the foregoing, together with those accounted for at date of last annual report as in the library, or drawn out, are in the library and in good condition.

LOANS FROM THE LIBRARY.

Publications drawn out, and not yet returned to the library, are as follows:

BY HOMER O. HITCHCOCK, M. D.

Memoirs of Diphtheria, Library No. 716.
Prevention of Cholera Infantum and Kindred Disorders, No. 1528.

BY HON. LEROY PARKER.

An Ordinance Relative to the Appointment and Duties of the City Physician of West Bay City, No. 1760.
Sanitary Chart on Management of Infants, No. 2515.

BY REV. D. C. JACOKES, D. D.

Report of Mass. Board of Education on Proposed Survey of the Commonwealth, No. 869.
Memorandum of the Am. Pub. Health Association, on Legislation affecting public Health, No. 1750 (1255).

Circular of inquiry by Wis. Board of Health to School Teachers.
Thirteenth Ann. Report of Health Dep., Cincinnati, O., 1879, No. 2009.
Sanitary Engineer for Feb. 15, 1881.

BY HENRY F. LYSTER, M. D.

Separate System of Drainage, No. 326.
Public Health, June 9, 1876.
Uppingham By-Laws and Regulations and House Drainage, No. 966.
Plumber and Sanitary Engineer, Oct., Nov., Dec., 1878.
Statement of Objects of Sanitary Protection Association, Newport, R. I., No. 1369.
Statement of Objects of Sanitary Protection Association, Edinburgh.
Twelve Photographs of Illustrative Diagrams on the Influence of Climate on Phthisis and Rheumatism, No. 1595.
Circulars on House Drainage, Mass. State Board of Health, Nos. 1367 and 1599.
Playter's Elementary Anatomy, Physiology and Hygiene, No. 1762,
Sewerage at Providence, No. 4784.
Storm-water in Town Sewerage, No. 2441.
Sewering of Cities, No. 2442.
Separate System of Sewerage, No. 2907.
Climatic Treatment of Consumption, No. 6238.
Medical Communications of Mass. Med. Society, No. 4740.

BY JOHN H. KELLOGG, M. D.

Nat. Board of Health Bulletin, Sup. No. 7, 1880, No. 3840.
Nat. Board of Health Bulletin, Sup. No. 17, 1882, No. 3841.
Collective Investigation of Diphtheria, No. 3842.
Glasgow Sanitary Journal, Nov. 10, 1884.
Report of Proceedings of Illinois State Board of Health, July 2-3, 1885, No. 5060.

BY HENRY B. BAKER, M. D.

Journal of Hygiene for Sept., 1881.
Vol. 35, Med. Chir. Soc. Trans. London, No. 2642.
N. Y. Med. Abstract, April, 1883.
College and Clinical Record, May, 1884.
The Typhoid Fever of America, No. 3905.
Jour. Franklin Institute, Nov., 1884.
Buffalo Medical and Surgical Journal, Aug., 1885.
Med. Com's Mass. Med. Soc., 1862, Vol. X.
Scientific American Sup., Vol. XXV, No. Apr. 7.
Science, Vols. VII and XI.
Journal of American Med. Association, April 14, 1888; Aug. 13, 1887; July 30, 1887; July 2, 1887; Dec 24, 1887; July 16, 1887.
The Sanitary News, Nov. 19, and Dec. 3, 1887; Jan. 28, Feb. 4, and 11, 1888.
New York Med. Journal, Oct. 1, 1887; Mar. 17, 24, and April 4, 1888.
Scientific American, Vol. LVIII, No. 16, April 21, 1888.
Popular Science Monthly, Jan., 1888.
New York Medical Journal, Apr. 14, 1888, No. 15, Vol. 47.
The Climate of Southern Russia and Iowa Compared, by Dr. Gustavus Hinrichs.
Nature, No. 10, vol. 37, Jan. 5, 1888.
Medical News, No. 11, vol. 51, Sept. 10, 1887.
Weekly Abstracts of Sanitary Reports, vol. 3, No. 13.
First Quarterly Report of the Michigan State Laboratory of Hygiene.
Weekly Abstracts of Sanitary Reports, Vol. 3, No. 11.
Med. Com's of the Mass. Med. Soc., Vol. 14, No. 1, 1887.
The Practitioner, Vol. 39, No. 2.
Report of the State Board of Health of Mass. on the Water Supply and Sewerage.
Journal of the American Medical Association, Vol. 8, No. 26, June 25, 1887.
Bulletin de la Societé Royale de Medecine Publique du Royaume de Belgique, Vol. 5.
Weiner Medizenische Press, No. 52.
The Sanitary Inspector, March, 1888.
The Medical Age, April 10, 1888.

American Lancet, April, 1888.
British Med. Journal, Jan. 28, 1888.
The Lancet, March 12, 19 and 26, 1887.
Science, No. 269, Vol. 2, March 30, 1888.
Lancet, Aug. 20, 1887.
British Med. Journal, Aug. 20, 1887.
New York Med. Abstract, July, 1887; March, 1888, Vol. 8.
Maryland Med. Journal, Vols. 8, 9, and 11, Nos. 3082, 4489, 4829.
The Practitioner, Jan.-June, 1883, No. 3875, July-Dec., 1879, No. 3122.
London Lancet, 1879, No. 3157.
London Lancet, Jan.-June, 1882, No. 5122.
Med. Record, Vol. 19, 1881, No. 3103; Vol. 20, 1881, No. 4469; Vol. 23, 1883, No. 3381.
Therapeutic Gazette, Vol. 10, 1886, No. 6027.
Popular Science Monthly, Vol. 13, 1887, No. 1592.
American Med. Bi-weekly, 1879, No. 1134.
American Med. Science, July-Oct., 1879, No. 3109.
Cincinnati Lancet and Clinic, July-Dec., 1882, 3668.
What is Malaria? Oldham, No. 4215.
Transactions Med. Association, Alabama, 1885, No. 5173.
Use of the Microscope. G. W. Rafter, No. 5604.
Therapeutic Gazette, Mar. 15, 1887.
St. Louis Med. Journal, Feb. 1887.
The Med. Age, Jan. 10, 1887, and Jan. 10, 1884.
Louisville Med. News, Dec. 12, 1885.
Sup. No. 14, Nat. Board of Health, July 23, 1881.
New York Med. Journal, April 28, 1888.
New England Med. Mo., May 15, and April 15, 1885.
Malaria, What it Means. Edwards.
Epidemic of Malarial Disease, etc. R. W. Griswold, M. D.
Guide to Shipmasters, etc. N. C. Board of Health, No. 2730.
La Malaria De Rome, etc.: C. D. Crudeli, No, 2659.
Influence of Malaria and Quinine upon Pregnancy, etc.: G. T. McKeogh M. D., No. 5514.
Malaria, Its Origin and Cause, etc. E. R. Eggleston, No. 5875.
Malaria: J. L. R. Wadsworth, M. D., No. 2125.
N. C. Med. Journal, Sept., 1885, and Nov., 1886.
Medical Standard, March, 1888.
Transactions 34th Annual Session of the North Carolina Med. Society, No. 6230.
Report Penn. State Board of Health, No. 5611.
London Lancet, Vol. 2, 1886.
British Med. Journal, July-Dec., 1886, No. 6026.
Report of Commissioners on Sanitary State of the Army of India, 1864, No. 4918.
Journal Med. Association, Vol. 6, 1886, No. 6029.
Medical Record, Vol. 25, 1884, No. 4472.
Chicago Med. Journal and Ex., Vol. 47, 1883, No. 4523.
Philadelphia Med. Times, Vol. 12, No. 3674.
Proceedings Cincinnati Med. Society, 1881, Vol. 2.
Transactions Louisiana State Med. Society, 7th Annual Session, 1885, No. 5092.
Jour. American Med. Ass'n, Vol. 7, 1886, No. 6030.
Druggist Circular and Chemical Gazette, Vol. 28, 1886, 4820.
Scientific American, Vol. 47, 1882, No. 3753.
Cincinnati Lancet and Clinic, Vol. 8, 1882, No. 4520.
Good Health, 1881, No. 3117.
Physician and Surgeon, Vol. 1, No. 3070.

BY GEO. E. RANNEY, M.D.

Physician and Surgeon, Aug., 1885.

BY BELA COGSHALL, M.D

Scientific American, July 5, 1879.

BY H. C. HAHN, PH. D.

Vol. viii. Index Catalogue, No. 6139.

BY ARTHUR HAZLEWOOD, M.D.

Parkes' Hygiene, No. 4128.

BY JOHN AVERY, M. D.

Trans. of Mich. State Med. Society, 1874, No. 73.
Am. Public Health Ass'n, Vols. 4, 5, and 6, Nos. 3236, 3237, 3238.
British Med. Jour., Jan.-June, 1883, and Vols. 1, 2, 1884, Nos. 3874, 4483, 5104.
London Lancet, July-Dec., 1882, and Jan.-June, 1883, Nos. 3724, 3879.
Popular Science Monthly, Vol. 25, May-Oct., 1884, No. 4831.
Floating Matter of the Air, No. 2603.
Scientific Am. Sup. Jan.-June, 1884, Vol. 17; Jan.-June, 1882, Vol. 13; Jan.-June, 1883, Vol. 15; July-Dec. 1884, Vol. 18; July-Dec., 1881, Vol. 12; July-Dec., 1882, Vol. 14; Nos. 4462, 3378, 3884, 5116, 3195, 3725.
5th Ann. Report, State Board of Health of Conn., 1882, No. 3503.
N. Y. Medical Abstract, July 1886.
N. Y. Medical Journal, Oct. 23 and 30, 1886.
Prize Essay, by A. N. Bell; Schools, No. 5849.

BY C. C. YEMANS, M. D.

Report on Plans for Securing Records of Deaths, No. 1703.
State Board of Health, Indiana, etc., Stevens, No. 3395.
Some Fallacies of Statistics: Rumsey, No. 678.
Death Rate of Each Sex in Mich.: Baker, No. 538.

BY HON. W. W. ROOT, M.D.

Sanitary Work in Lansing, Mich., No. 2031.
Mayor's Address, Aurora, Ill., 1879, No. 1414.

BY I. H. BARTHOLEMEW, M.D.

Medical News, Vol. 49, No. 6018.

BY FOSTER PRATT, M.D.

National Board of Health Report, 1885.

BY HERMAN OSTRANDER, M. D.

Human Body: Martin, No. 4021.
Handbook of Physiology, Kirke, Vols. 1, 2; Nos. 5414, 5415.
Medical Jurisprudence of Insanity: Brown, No. 669.
Medical Thermometry and Human Temp., No. 667.
Aitkin's Practice of Medicine, Vol. 1, No. 1029.

BY BION WHELAN, M. D.

Giving notice to householders of presence of contagious diseases, and establishing quarantine, issued by Board of Health of St. Clair City, No. 2624.
"Health Regulations" of the village of Tecumseh.
Orders, Regulations and Suggestions of the Board of Health of Mt. Pleasant, N. Y., No. 4045.
Hygea—A City of Health, Richardson, No. 744.
The Therapeutic Gazette, Oct. 15, 1885.

BY M. T. GASS.

Registrations of Plumbers, etc., Health Department, N. Y. City, No. 3215.

BY PROF. VICTOR C. VAUGHAN, M. D.

Le Service Communal de la Disinfection a Bruxelles, No. 4616.
Internationaler Congress for Hygiene, Nos. XII, IV, XXIII, VII, XXV, VIII, XIII, IX, XXI, XIV, XV, XVI, XVII, XIX, XX, I, II, III, V, X; Library Nos. 6080, 6074, 6089, 6076, 6090, 6077, 6081, 6078, 6088, 6082, 6083, 6084, 6085, 6086, 6087, 6071, 6072, 6073, 6075, 6079.
Annals of Hygiene, Nov. 1, 1887.
Monthly Sanitary Record, Feb. No., Vol. 1.

BY J. M. MEAD, M. D.

Nichols on Water Supply, No. 3683.

BY PROF. S. W. BAKER.

Am. Soc. Sci. Ass'n, 1874, No. 878.
Report of Com. concerning San. condition of Schools in Philadelphia, No. 1767.
Trans. San. Inst. Great Britain, 1879, No. 4688.

BY J. C. ESLOW.

American Sanitary Engineering.—Philbrick. No. 2471.
Proposed Plan for a Sewerage System.—Samuel W. Gray, No. 4628.
Sewage Disposal.—Henry Robinson, No. 3925.
Sanitary Engineering.—Cain. No. 1968.

BY JOHN P. SANFORD.

Forms of Water. No. 1037.

BY HON. P. P. SHORTS, M. D.

Rules for Checking Contagious Diseases, No. 5622.
Laws Requiring Medical Men to Report Deaths, No. 3256.
Infectious Diseases in Public Schools.—L. W. Baker.
Prevention of Diphtheria, Scarlet Fever, etc.—J. H. Raymond.
Prevention of Contagious Diseases.—James Crane. No. 2610.
Prevention of Introduction of Com. Diseases.—Mich. S. B. of H.
Proceedings of Nat. Conference of State Boards of Health.
Prize Essays.—Am. Pub. Health Ass'n, 1885, No. 5434.

BY CHAS. F. RUGGLES.

Curative Effect of Baths, No. 131.
Popular Science Monthly, Vol. 12, No. 1591.
Medical Record, Vol. 13, No. 1587.
London Lancet, July-Dec., 1883, No. 4530.
Scientific American Sup., July 9. 1887.

BY D. A. MCLEOD, C. E.

How to Drain a House.—Waring, No. 5167.
Women, Plumbers and Doctors, No. 4888.
Drainage, Sewerage of Dwellings, No. 4084.
Sewage Question, No. 180.
Sanitary Engineering, No. 149.
Sewerage of Binghampton, No. 3479.
Sewerage of Memphis, No. 2440.
Practical Points about Plumbing, No. 2858.
Separate vs. Combined System, No. 5009.
Sewerage System, No. 5698.
Methods of Sewerage for Cities, No. 5697.
Drainage and Sewerage of Hyde Park, No. 5010.
Report of Mass. Drainage Com., No. 5394.
Earth Closets, No. 652.
Sewerage of Memphis, No. 2443.

MISCELLANEOUS.

The following blanks and diagrams, designed for distribution, are now at hand:—

Blank (L).—For report of an outbreak of a disease dangerous to the public health	140
Blank (M).—For weekly report during an outbreak of a dangerous communicable disease	4,200
Blank (K).—For special final report relative to a dangerous communicable disease	980
Diagram.—Restriction of Diphtheria in 1886	700
Diagram.—Restriction of Scarlet Fever in 1886	700

PAPER ON HAND, PURCHASED, USED, ETC.

The following table shows the amount and kind of hard and soft paper there was on hand at the time of making the last report, the amount purchased during the year, the amount used, and the amount now on hand:—

Kind of Paper.	On hand at Last Report.		Purchased Since Last Report.		Used During the Year.		On Hand Now.	
	Reams.	Sheets.	Reams.	Sheets.	Reams.	Sheets.	Reams.	Sheets.
Flat	1	418	6	....	2	93	5	325
Crown	....	....	16	....	8	....	8	....
Folio Post	16	404	15	....	15	240	16	164
Demy	8	238	....	....	....	165	8	73
Medium	1	240	....	....	....	26	1	214
Byron Weston	....	361	....	....	....	5	....	356
Foolscap	1	16	1	....	....	352	1	180
Legal cap	....	118	2	....	....	68	2	50
Blotting paper	....	237	....	....	....	62	....	175
Blue cover paper	1	396	7	....		441	2	471
Postoffice paper	1	300	....	....	....	....	1	300
Book paper	....	216	....	....	....	....	....	108
Manilla wrapping paper	3	195	2	....	1	363	3	348
Carbon paper	....	60	....	....	....	....	....	60
Bond paper	....	100	....	....	....	100	....	....

The hard paper has been used for making blank books for use in office, circulars, announcements and programs for sanitary conventions, printed letters, writing paper, etc. The cover paper has been used for covers to reprints and record books for weekly reports of diseases, and wrappers for packages of ozone test paper.

There are now on hand 1,500 sheets of one-half letter made from book paper.

There are now on hand 4,320 sheets of hard paper of half letter size, 26 sheets of note paper, and 634 sheets of one-half note size.

There were about 124,913 envelopes on hand at the time of making the last report; 22,500 of the various kinds used in the office have been purchased since, making a total of 147,413. There are on hand now of printed envelopes 51,038, of blank envelopes 67,633, making a total of 118,671. About 28,742 have been used in the work of the office.

There was on hand at the time of making the last report, $152.77 in postage stamps, postal cards and postal money. Vouchers for postage (for use in the office) have been allowed during the nine months to the amount of $350.00. There is now on hand in postage stamps $14.00, and postal money $14.51, a total of $28.51. (This does not include postal cards printed upon, but not yet used.) The cost of postage during the nine months has been $474.26, as follows:—

Distribution of annual reports	$50 53
General distribution of documents and circulars	97 37
Sending weekly and monthly bulletins	20 96
Collection and dissemination of statistics and information in regard to communicable and other diseases	93 14
Sending announcements and programs for sanitary conventions	36 84
Sending meteorological material to observers	7 86
Regular and special correspondence of the office, and all other postage (including a considerable amount for distribution of documents on the restriction of diphtheria, scarlet fever typhoid fever, in localities where those diseases occurred)	167 56
Total	$474 26

TOTAL AMOUNT AND CLASSIFICATION OF EXPENDITURES BY THE STATE BOARD OF HEALTH DURING THE FISCAL YEAR—TWELVE MONTHS—ENDING JUNE 30, 1888, AS PER VOUCHERS NUMBERS 1456 TO 1598 INCLUSIVE, EXCEPT NUMBERS 1596 AND 1597.

Chemical analyses		$00 00
Engraving, drawing, etc.		25
Expenses of members	Attending Meetings	125 49
	Other Official	549 49
Instruments and books		386 26
Paper, Stationery, etc.		309 00
Postage	Office	650 00
	Members	1 75
Printing and binding		619 60
Secretary		2,500 00
Special investigations		86 79
Miscellaneous		146 65
Total		$5,375 28

Respectfully submitted.

Henry B. Baker,
Secretary,

Having examined the Secretary's annual report of property received, issued and expended during the fiscal year ending September 30, 1888, and having compared the foregoing account of expenditures with the books in the Auditor General's office, I find the same to be correct.

Arthur Hazlewood,
Com. on Finances.

Lansing, Mich., July 10, 1888.

EXPENDITURES BY THE STATE BOARD OF HEALTH IN THE CALENDAR YEAR, 1887.

The foregoing is reported, in compliance with law, relative to the fiscal year. But the appropriations for the Board are for the calendar year, and they amount to six thousand dollars. The expenditures for any calendar year, therefore, cannot exceed six thousand dollars. The following is a classified statement of expenditures for the calendar year 1887.

CLASSIFIED STATEMENT OF EXPENDITURES BY THE BOARD DURING THE CALENDAR YEAR 1887.

Chemical analyses		....
Engraving, drawing, etc.		25
Expenses of members	Attending meetings	139 85
	Other official	552 15
Instruments and books		457 06
Paper, stationery, etc.		444 14
Postage	Office	1,100 00
	Members	1 00
Printing and binding		536 76
Secretary		2,500 00
Special investigations		135 18
Miscellaneous		133 19
Total		$5,999 58

EXPENDITURES ON ACCOUNT OF THE BOARD.

The appropriations ($6,000) at the disposal of the State Board of Health are for certain specified purposes, not including clerk hire, the publication of the annual report, or the expenses in the examination of plans for public buildings; these expenditures *on account of* but not by the board are provided for by other acts of the legislature, than those appropriating money to be expended by the board, and the accounts are kept in other offices, not in the office of the Board of Health: the accounts for clerk hire are kept by the Auditor General, and reported in his Annual Report; the accounts for publication of the annual reports, and for expenses in the examinations of plans for public buildings, are kept by the Board of State Auditors, and are published in the Annual Report of that Board.

Respectfully submitted.

Henry B. Baker.

SANITARY CONVENTIONS.

Four Sanitary Conventions have been held during the year ending June 30, 1888, under the auspices of the State Board of Health, and on invitation of the citizens of Traverse City, Owosso, Albion, and Manistee.

THE SANITARY CONVENTION AT TRAVERSE CITY.

This convention was held Aug. 24 and 25, 1887. At the first session, Hon. Perry Hannah, president of the village, delivered the address of welcome. Frank Hamilton, president of the convention, made an address. J. D. Munson, M. D., medical superintendent of the Northern Asylum for the Insane, read a valuable paper on "Insanity: Its Causes and Prevention," which was discussed.

The second session was taken up with a discussion of the present and future water-supply of Traverse City, and it brought out many valuable practical suggestions.

At the remaining sessions of the convention, papers were read on "The Work of a Village Health Officer," "The Sewerage of Traverse City: Its Necessity and Practicability," "Foods and their Adulterations," "The Money Value of Sanitary Work," and the "Drink Problem." All of these papers were thoroughly discussed by the citizens of Traverse City, by members of the State Board of Health, and others in attendance on the sessions of the convention.

THE SANITARY CONVENTION AT OWOSSO.

This convention was held Nov. 22 and 23, being presided over by Rev. Geo. H. Wilson.

At the first session a valuable paper was read by Hon. John Avery, President of the State Board of Health, on "The Prevention of Contagious Diseases." This paper deals with scarlet fever, diphtheria, measles, whooping-cough, the precautions to be taken for their restriction, and gives at the close a summary of the methods of disinfection recommended by the State Board of Health.

A paper on "House Building from a Surgeon's Standpoint" was read by Prof. Hal. C. Wyman, M. D., in which the speaker mentioned the most glaring evils met with in the construction of houses—evils which are most easily remedied. It contained many valuable suggestions.

The water-supply of Owosso was treated of in a paper by Stanley E. Parkill, giving diagrams of a part of the city of Owosso, and the location of wells and privy vaults on two blocks in the city, also results of chemical analyses, by Mr. Parkill, of twenty-six samples of drinking water from wells in Owosso.

Papers were read by J. A. Wessinger, M. D., on "Impure Drinking Water as a factor in the Causation of Disease"; by H. D. Bartholomew, C. E., on the "Disposal of Waste in Owosso by Sewerage and Otherwise"; by A. M. Hume, M. D., on the "Work of the Local Board of Health"; by C. McCormick, M. D., on "The Sanitary Condition of Owosso School Buildings and Grounds"; by E. B. Ward, M. D., on "Clothing," and by S. P. Duffield, M. D., on "The *Pro* and *Con* of the Pasteur Method of Inoculation to prevent Hydrophobia."

THE SANITARY CONVENTION AT ALBION.

This convention was held Dec. 6 and 7, 1887, and was presided over by President L. R. Fiske, D. D., LL. D. The sessions were all largely attended, the opera house being crowded at the evening meetings.

The main interest of the first part of the convention centered about the discussion of the present and future water-supply of the city of Albion. A paper on this subject by Prof. Delos Fall, of Albion College, gave the results of analyses of thirteen different samples of water from the wells of Albion, eight of these analyses being made by Prof. Fall in the laboratory of Albion College, and five in the laboratory of the University of Michigan under the direction of Prof. V. C. Vaughan. The paper was illustrated by diagrams of a residence block and a business block in the city of Albion, showing relation of wells to privy vaults, also a diagram exhibiting the relation between the number and nearness of privy vaults to wells, and the dangerous impurities in the water in those wells in Albion. The whole subject of water-supply was discussed by Prof. V. C Vaughan, M. D., Ph. D., and others.

Papers were also read on the "Disposal of Waste in Albion by Sewerage and otherwise," "School Hygiene," "Nuisances: What they Are and How to Prevent them," "Diseases Incident to Poverty," and the "Money Value of Sanitary Work."

The closing session of the convention was taken up with the discussion of the subject of the prevention of the communicable diseases from the four standpoints of the clergyman, the lawyer, the health officer and the State Board of Health. Dr. Henry B. Baker, in a paper on the subject from the standpoint of the State Board of Health, presented diagrams showing that in those localities in Michigan where isolation and disinfection were neglected, during the year 1886, there were about five times as many cases and deaths from diphtheria and scarlet fever as there were in those localities where these recommendations of the State Board of Health were carried out; that in the localities where these recommendations were adopted there was probably a saving of over 600 cases of scarlet fever, and over 1,500 cases of diphtheria, in the single year 1886.

THE SANITARY CONVENTION AT MANISTEE.

This convention was held June 5 and 6, 1888, and was presided over by Hon. T. J. Ramsdell.

At the first session of the convention, J. A. King, M. D., of Manistee, read a paper on the present and future water-supply of Manistee, in which he discussed the outbreak of typhoid fever in Manistee the previous fall and winter, and its probable connection with the water used. The paper was discussed by Arthur Hazlewood, M. D., and J. H. Kellogg, M. D., members of the State Board of Health, who spoke of the manner in which typhoid fever and other diseases are sometimes spread by water-supply.

At the second session App. M. Smith read a paper on the "Relations of the Press to Sanitation," and J. H. Kellogg, M.D., gave an address on Ventilation, illustrated with various apparatus and experiments.

At the third session of the convention, Rev. A. Walkley spoke on the "Hygiene of Baths and Bathing," and described the system in operation by the Emeline Bath Co. of Manistee.

Papers were also read during the convention on the "Disposal of Waste in Manistee by Sewerage and Otherwise," "The Causes and Prevention of Consumption," "The Hygiene of Schools," and "The Restriction and Prevention of Communicable Diseases."

At these different conventions, pamphlets issued by the State Board of Health, dealing with the different subjects discussed, were distributed to the audience; and the printed proceedings of the conventions were afterwards sent to the localities where the conventions were held, and to other places where it was thought that they would do good.

ABSTRACTS AND BRIEF ACCOUNTS OF THE PROCEEDINGS AT MEETINGS OF THE STATE BOARD OF HEALTH DURING THE FISCAL YEAR, ENDING JUNE 30, 1888.

REGULAR QUARTERLY MEETING, JULY 12, 1887.

Members present:—Hon. John Avery, M. D., President; Prof. Victor C. Vaughan, M. D.; Arthur Hazlewood, M. D.; J. H. Kellogg, M.D.; and Henry B. Baker, M. D., Secretary.

EXAMINATION OF PLANS FOR PUBLIC BUILDINGS AND FOR SEWERAGE AT STATE INSTITUTIONS.

Besides a large amount of routine work, plans for proposed State public buildings were presented to the board for approval as follows: two cottages proposed to be erected at the Asylum for the Insane at Pontiac, and the plans of the Northern Prison at Marquette. A plan was also presented for constructing a sewer from the State Reform School to the main sewerage system of Lansing. The report of the examination of these plans, with recommendations and suggestions, is printed further on in this report.

THE "DRYING" SYSTEM OF DISPOSAL OF EXCRETA.

Dr. Kellogg, one of a committee on best method of disposing of excreta in poor-houses and jails, made a verbal report in regard to the "drying" system of disposal by passing over the excreta the foul air of buildings before it passes up through the foul air shaft to the outer air. He had visited and examined a school-building near Chicago in which that system was in use, and he was convinced it was pernicious. The privy-vault odor was all through the house. In winter the great difference in temperature between the indoor and the outdoor air causes a strong draft, and the foul air passes out through the privy-vault, so this method might do well enough in winter, but in summer the air is sometimes colder indoors than out-of-doors, so the current of air is then reversed, filling the building with foul odors. He said it was not easy to recommend any one way for the disposal of excreta in jails and poorhouses, because not all are under the same conditions. In some places the dry-earth system may be the best practicable, while in others the water-tight cess-pool to be emptied from time to time was the best that could be done. The best way was not yet discovered.

The committee was continued.

Dr. Baker suggested that even when the method by "drying" the excreta is perfectly accomplished, there is the possibility of carrying up into the atmosphere the germs of typhoid fever which have not yet been proved to be destroyed by drying, and which it may be very dangerous to scatter wherever the winds may carry them.

SANITARY CONVENTION AT TRAVERSE CITY.

An invitation to hold a sanitary convention in Traverse City was read and accepted. It is to occur August 24 and 25, 1887.

NATIONAL CONFERENCE OF STATE BOARDS OF HEALTH.

The secretary presented a report of a committee appointed to formulate questions to be presented at the meeting of the National Conference of State Boards of Health which meets in Washington, in September, 1887. The questions to be presented are designed to elicit information relative to the methods employed by the various State Boards of Health in restricting dangerous communicable diseases, and in securing information about them. The secretary is prepared to present at that meeting a description of the Michigan method, which is to secure prompt reports of outbreaks from health officers; to coöperate with the health officers by sending them advice and suggestions relative to isolation and disinfection, and to secure distribution to the people of small documents which give plain directions for the restriction and prevention of each of the dangerous communicable diseases. [Dr. Baker's report of attendance at this conference is printed on pages 190-196 of the report for 1887.]

DANGER FROM THE USE OF GASOLINE.

Dr. Kellogg made a brief report upon the use of gasoline, showing that dealers did not represent gasoline to be a dangerous product. He would make some experiments in regard to this subject, and prepare a circular giving rules for the use of gasoline with safety. [This circular is printed on pages 24-28 of the report for 1887.]

TYROTOXICON IN ICE CREAM.

Dr. Vaughan reported that he had found tyrotoxicon in the ice cream which poisoned 150 people at Amboy, Ohio, July 4, and which had been sent to him by request of the Secretary of this Board. A few drops of the poison extracted from it killed a kitten in ten minutes. He had also found the poison in the ice cream which poisoned 50 persons at Geneva, N. Y.

RESULTS OF WORK WITH SCARLET FEVER IN 1886.

The secretary presented the following table which shows that with scarlet fever in 1886, when health officers acted promptly and efficiently, and the people coöperated perfectly, there were only one-fourth as many cases, and about one-fifth as many deaths on the average as in outbreaks where they did not so act:

TABLE.—*Scarlet Fever in Michigan in 1886; Exhibiting the Average Numbers of Cases and Deaths per outbreak; (1) in all the 324 outbreaks Reported, (2) in the 220 outbreaks in which it is Doubtful whether or not Disinfection and Isolation were secured, (3) in the 45 outbreaks in which Isolation or Disinfection or both were Neglected, and (4) in the 59 outbreaks in which Isolation and Disinfection were both enforced. Compiled in the office of the Secretary of the State Board of Health, from reports make by local health officers.*

	(1.) All Outbreaks. (324 Outbreaks.)		(2.) Isolation or Disinfection not mentioned or Statements doubtful. (220 outbreaks.)		(3.) Isolation or Disinfection or both Neglected. (45 outbreaks.)		(4.) Isolation and Disinfection both Enforced. (59 outbreaks.)	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Totals......	1,716	100	914	41	623	46	179	13
Averages..	5.30	0.31	4.15	0.19	13.84	1.02	3.03	0.22

The Secretary presented the following:

REPORT ON LEGISLATION IN MICHIGAN IN 1887 ON SUBJECTS RELATING DIRECTLY OR INDIRECTLY TO PUBLIC HEALTH AND SAFETY.

Act No. 2. An act making an appropriation for the equipment, support and expenses of a State weather service.

[The "weather service" is for the benefit of agriculture and commerce, etc., and the act has no reference nor close relation to the work of the State Board of Health; it does not provide compensation for the excellent corps of meteorological observers already in the service of this Board; it does not directly and it is hoped that it may not indirectly interfere with their important work in the interests of public health.]

Act No. 11. An act to prevent the adulteration of candies and confectioneries and the sale thereof, when so adulterated as to be injurious to the public health. This act was ordered to take immediate effect.

[This makes it the duty of the local health officer or local board of health to investigate complaints made on affidavit. If reasonable cause of action be found the health officer or board shall report it to the prosecuting attorney whose duty it shall be to prosecute for the offense.]

Act No. 47. An act to amend section 22 of act 182 of the session laws of 1885, entitled "An act to provide for the appointment of a State Live Stock Sanitary Commission," etc. This act takes immediate effect.

[This act makes the law apply to horses and sheep which before were excepted from the provisions of the law.]

Act No. 57. An act to amend section 5 of an act entitled "An act to regulate and provide for the carrying, yarding, and feeding of so-called Texas cattle while in transit into or across this State between the first day of April and the first day of November of each year," approved June 16, 1885. This act took immediate effect.

[This amendment merely leaves out this sentence from the act: "This act shall not prevent the driving of cattle direct to slaughter houses from the cars or pens."]

Act No. 88. An act to amend section 1 of act 147, of the session laws of 1885, entitled "An act to provide for the introduction and use on all cars owned and operated by any railroad company or other corporation doing business in this State, of some form of automatic car coupling, by means of which all cars may be coupled and uncoupled without the necessity of the brakeman or any other person passing between the cars." This act took immediate effect.

[This amendment provides that after January 1, 1891, no freight car shall be run upon any of the railroads in Michigan, unless furnished with safety couplers as provided in the act.]

Act No. 105. An act to amend section 5 of act 182 of the public acts of 1885, entitled "An act to provide for the appointment of a Live Stock Sanitary Commission and a State Veterinarian, and to prescribe their powers and duties, and to prevent and suppress contagious and infectious diseases among the live stock of the State," and to repeal section 6 of said act, and add another section thereto to stand as section 23. This act takes immediate effect.

[The purpose of sections 5 and 6, act No. 182, laws of 1885, which this act changes, was that communicable diseases of animals, especially such diseases as hydrophobia and glanders, dangerous to man as well as to animals, should be reported and dealt with by the local board of health, and that the lives of men as well as of animals be thus protected until the Live Stock Commission should receive notice and relieve the local board from the care of such animals. Section 5 is amended so that, instead of reporting a case of infectious or contagious disease in animals to the health officer, president or clerk of the board of health in the locality, it shall be the duty of the person who discovers or suspects any such case to report it to the State Live Stock Commission or a member thereof. (The address of the president of the Live Stock Commission is now at Stanton, Mich.) Section 6, which is repealed, prescribed the duties of the local board of health upon the occurrence of a case of such disease in any animal. Section 23, the new section, provides a penalty for the violation of the act, or of the rules and regulations of the commission, or for an evasion of quarantine proclamation by the Governor, by any railroad company, navigation company, or common carrier. The penalty is not less than $500 nor more than $5,000.]

House bill No. 163, introduced by Mr. Bardwell, entitled "A bill for the prevention and restriction of hydrophobia and glanders," passed both houses but was then reconsidered and tabled in the Senate. It provided that a case of hydrophobia or glanders in any person or animal should be reported immediately to the local health officer; and that the health officer should immediately take action, and also report the cases to the State Board of Health. It also provided for the destruction of the animals by the local health authorities. This bill was urged on the ground that hydrophobia and glanders are diseases so dangerous to man that even when they occur in animals they should be under the immediate supervision of the local health authorities.

The failure of this bill to become a law, and the repeal of sections five and six of act 182, laws of 1885, seem to leave no specific law in Michigan for the protection of human life and health from animals affected with diseases dangerous to man. There is a State Live Stock Commission, but it is declared in section four, that "It shall be the duty of the Commission to protect the health of the domestic animals of the State," etc.

Act No. 118. An act to provide for the better protection of lives of passengers and employés on railroad trains. This act takes effect Sept. 27, 1887.

[This act provides that on and after Nov. 1, 1888, there shall be on all railroads in Michigan effective provision in passenger cars against the burning of the cars. The heat must be generated outside the car, or the heater must be enclosed in boiler iron, or there must be some arrangement for extinguishing the fire in the event of the car overturning. Section two says that no stove or heater shall be used on a passenger car unless it be enclosed in boiler iron.]

Act No. 129. An act to prevent the carrying of concealed weapons and to provide punishment therefor. This act takes effect Sept. 27, 1887.

Act No. 136. An act to provide for blowers in establishments where emery wheels or emery belts are used. This act takes effect Sept. 27, 1887.

Act No. 152. An act to prohibit the employment of male children under fourteen years of age and female children under sixteen years of age for more than nine hours a day. This act takes effect Sept. 27, 1887.

[This act does not apply to agriculture, domestic service and stores.]

Act No. 165. An act to amend section 15 of chapter 3 of act 164 of the public acts of 1881, entitled "An act to revise and consolidate the laws relating to public instruction and primary schools, and to repeal all statutes contravening the provisions of this act," approved May 21, 1881, as amended by act 93 of the public acts of 1883, approved May 16, 1883. This act takes effect Sept. 27, 1887.

[In this section the reference to the State Board of Health is left out, so that after this act takes effect this Board will not be required to examine text books on physiology and the effects of alcohol and narcotics.]

Act No. 196. An act to amend section 10 of act 134 of the public acts of 1885, entitled "An act to regulate the practice of pharmacy in the State of Michigan." This act takes effect Sept. 27, 1887.

[This amendment provides that the act shall not apply to the vending of patent or proprietary medicines by any retail dealer who has been in such business three years or more. It leaves out the provision of the old law that the law shall not apply to "the business of any retail dealer engaged in business at a distance of not less than five miles from the limits of any incorporated village or city except physicians' prescriptions." Two provisions are added: One provides that any one who, within three months after the act takes effect, sends satisfactory proof to the board of pharmacy that he was engaged in the business of a dispensing pharmacist three years next previous to the second day of June, 1885 (or any one who was engaged in such work for the same time in Michigan), shall be granted a certificate. The second provides for a certificate of registered "assistant" to one not under 16 years old who passes a satisfactory examination before the board of pharmacy.]

Act No. 213. An act to provide for the appointment of inspectors of mines and their deputies in certain cases, to prescribe their powers and duties and provide for their compensation. This act took immediate effect.

[Section three prescribes the duties of this inspector, which look mainly to the prevention of accidents in mines.]

Act No. 246. An act to prevent the sale of impure, unwholesome, adulterated or swill milk in the State of Michigan, and to provide for inspectors. This act took immediate effect.

[This act provides for an inspector of milk in Detroit and for each city and incorporated village in the State. It is made unlawful for any person to sell, or expose for sale any unwholesome, watered, adulterated or impure milk or swill milk or colostrum, or milk from cows kept upon garbage, swill, or other deleterious substance, or from cows kept in connection with any family in which there are infectious diseases. It is the duty of the inspectors of milk to personally view, as far as possible, all milk exposed for sale, and to visit all dairy houses, barns or stables, to inspect the same, and the animals therein, and to visit all places where milk is kept or exposed for sale, and to inspect and ascertain the condition of said milk. The inspector in Detroit may visit all dairy houses, barns or stables in Wayne county, to inspect them and the animals. The jurisdiction of inspectors in other places is not stated; but the inspectors are to have such other powers as are conferred upon them by ordinances.]

Act. No. 259. An act to provide for an independent Forestry Commission of the State of Michigan, and to define its duties and powers, and to provide for the expense thereof. This act takes effect Sept. 27, 1887.

Act No. 264. An act to provide for the recovery of damages for injuries caused or sustained by reason of defective public highways, streets, bridges, sidewalks, cross walks, or culverts, and to repeal act 244 of the public acts of 1879, being compiler's sections 1442, 1443, 1444, 1445, 1446 of Howell's Annotated Statutes of Michigan. This act took immediate effect.

[Changes "good repair" to "reasonable repair." No damage can be collected for injury unless the proper authority has had knowledge or notice of defect, and sufficient time in which to make repair after receiving the notice.]

Act No. 268. An act to amend sections two and three of act 167 of the public acts of 1883, entitled, "An act to promote public health," approved June 6, 1883. This act takes effect Sept. 27, 1887.

[This amendment makes it necessary that the student who shall practice medicine shall be under the immediate supervision of a legally qualified physician. The clerks of townships, villages, and cities shall on or before the first day of January in each year send to the Secretary of the State Board of Health certified lists of records of physicians in practice within their jurisdictions.]

Act No. 292. An act to provide for the introduction and use of safety gates upon swing and draw bridges. This act takes effect Sept. 27, 1887.

REGULAR QUARTERLY MEETING, OCT. 11, 1887.

Members present:—Prof. Henry F. Lyster, M. D.; Prof. Victor C. Vaughan, M. D.; C. V. Tyler, M. D.; Arthur Hazlewood, M. D.; J. H. Kellogg, M. D.; and Henry B. Baker, M. D., Secretary.

INTERNATIONAL MEDICAL CONGRESS.

Dr. Hazlewood read a report of his attendance on the International Medical Congress in Washington, D. C., in September, 1887. This report is printed on pages 186–188 of the Report for 1887.

Dr. Vaughan also read a report of his attendance on the International Medical Congress, giving what he had gathered of the work of the congress on subjects relating to sanitary science and public health work. This Report is printed on page 189 of the Report for 1887.

SMEAD'S "DRY-CLOSET" METHOD OF DISPOSING OF EXCRETA.

An agent of Isaac D. Smead & Co., of Toledo, Ohio, came before the Board and extended an invitation to the Board to visit Toledo in a body, or to send a committee, to examine buildings in which their "dry closet" was in operation. He exhibited diagrams which were designed to explain this system of ventilation and disposal of excreta, and talked to the Board in advocacy of the plans as highly satisfactory in every way. He claimed that the air would have an outward motion through the vault and then upward through the chimney, at all seasons and times, and with the consumption of only a small quantity of fuel, even in seasons when the out-door and in-door air is of the same temperature, providing that all requirements of the company were complied with. At least three members of the Board had already examined buildings in which this system is in operation, but members of the Board studied the plans, asked many questions, and appointed Dr. Avery, the committee on ventilation, and Dr. Kellogg, the committee on disposal of excreta, to give the system a thorough examination, with permission to go where they should determine best to see the system in operation. It was decided that the system should be studied in different seasons of the year in order to give it a fair trial.

Dr. V. C. Vaughan made a verbal report relative to tyrotoxicon poisoning in Milan, Mich. His more complete report of this poisoning is printed on pages 12–19 of the Report for 1887.

EAST SAGINAW WATER-SUPPLY AND FILTER.

Correspondence with H. M. Newton, secretary of the East Saginaw board of water commissioners, was presented. It contained an analysis of the water of East Saginaw, and a description of the filter used. The point which the East Saginaw people wanted determined was,—Is that water so filtered a safe water for drinking and culinary purposes? The question was referred to Prof. Vaughan, chairman of the committee on water-supply, etc., for reply.

USE OF GASOLINE.

Dr. Kellogg, as a special committee on preparing a circular on use of gasoline, reported progress. He is gathering information and is making experiments, so that he hopes to have the circular ready before next summer. He thinks there is great need for the diffusion of information among the people in regard to using gasoline and gasoline stoves in a safe way. The dealers in those articles are no longer warning their patrons of the dangers and telling them how they can be avoided. The result will be the usual, if not a larger number of fearful explosions and burnings, when another summer comes. [This circular is printed on pages 24–28 of the Report for 1887.]

THE CAUSATION OF CONSUMPTION.

A few years ago Dr. Robert Koch of the Imperial Board of Health of Germany, through extensive researches and experiments discovered and demonstrated the cause of consumption to be a microscopic organism which has been named the *bacillus tuberculosis*. After much controversy, this now seems to be established. It is now acknowledged that *inoculation* with this organism in susceptible animals uniformly causes tuberculosis. At this meeting of the State Board of Health, Dr. Baker exhibited diagrams which illustrated a paper he read recently before a section of the International Medical Congress, in Washington, D. C., in which he claims to prove that consumption is, to a considerable extent, controlled by conditions of the atmosphere, both the sickness and the deaths rising a certain time after the temperature falls, and falling after the temperature rises. He claims that small-pox, and sometimes scarlet fever, and perhaps other communicable diseases that enter the body through the lungs and air-passages do the same, and that he has worked out the reasons why. [They are stated, in connection with the tables and diagrams exhibiting the facts, in a paper entitled "The Causation of the Cold Weather Diseases," printed on pages 197-211, of the Report of this Board for 1887.] Briefly, his explanation is that the breathing of cold air (which is always dry air, because cold air cannot contain much moisture) dries the throat and air-passages, that this leaves in the throat and air-passages salts of the blood, which do not evaporate with the moisture, that the albuminous parts of the blood, which do not pass out of the blood-vessels under other circumstances, do pass out whenever the salts accumulate greatly in the fluid which naturally moistens the throat and air-passages. Therefore, whenever a person has breathed unusually cold dry air until that fluid, because of its evaporation, contains much salt, the albuminous part of the blood comes out in the throat or lungs wherever the salty fluid is. Whenever this exudation occurs there is then a chance for the *bacillus tuberculosis* to lodge and multiply, because it is there kept in a nutritive solution at the temperature of the body. (A similar explanation applies to small-pox.) Dr. Baker claims, therefore, that he has shown by statistics, etc., that these diseases are controlled by the temperature and dryness of the atmosphere, and that he has pointed out the reasons why. Acknowledging that Dr. Koch has demonstrated that the *bacillus tuberculosis* is the cause of consumption whenever it gains entrance and lodgment in the body, Dr. Baker claims that he has himself discovered the cause of its gaining such lodgment,—in other words that his cause is "the cause that causes the cause" (which Dr. Koch discovered) to be effective in producing the disease.

TYPHOID FEVER IN MICHIGAN.

Owing to the greatly diminished rainfall during the spring and summer of 1887 and the consequent lowering of the water in streams, ponds, and wells, a marked increase in the prevalence of typhoid fever was feared and unusual efforts were put forth by the office of the State Board of Health for the prevention and restriction of the disease. At this meeting Dr. Baker presented facts concerning the comparative prevalence of this disease and the comparative rainfall and height of the ground water during the quarter, but as a more complete statement was made at the next meeting of the Board, held in January, and as the more complete tables and remarks will be printed in connection with the Secretary's quarterly report presented at that meeting, they are omitted here.

REGULAR QUARTERLY MEETING, JAN. 10, 1888.

Members present: Hon. John Avery, M. D., President; Prof. Victor C. Vaughan, M. D.; Arthur Hazlewood, M. D.; J. H. Kellogg, M. D.; and Henry B. Baker, M. D., Secretary.

MICHIGAN STATE LABORATORY OF HYGIENE.

Prof. Victor C. Vaughan, M. D., made his first quarterly Report of the Michigan State Laboratory of Hygiene, of which Prof. Vaughan is Director. This complete report is printed on pages 1–23 of the Annual Report of the State Board of Health for 1887.

SANITARY CONVENTION.

A communication from a committee of citizens of Manistee, asking the Board to hold a sanitary convention in that place was read; the invitation was accepted and the Secretary was appointed a committee to confer with the committee of citizens and arrange for the convention. [The convention was held June 5 and 6, 1887, and the proceedings have been published in pamphlet form.]

SANITARY SURVEY OF CITIES AND VILLAGES.

The Secretary of the Board was instructed to send circulars and blanks to the health officers of all cities and villages in Michigan urging a sanitary survey, a house-to-house inspection, next spring, and asking the health officers to mention the subject in their annual reports to the common councils or other local boards of health.

DIPHTHERIA: DIFFICULTIES IN ITS RESTRICTION.

To illustrate one of the questions which frequently arise in efforts for restricting communicable diseases, the Secretary read the following letter which had been received during the quarter:—

————————, Mich., Dec. 17, 1887.

Dr. H. B. Baker, Secretary State Board of Health:

DEAR SIR:—We are experiencing considerable trouble here in preventing the spread of diphtheria from the fact that two of our physicians will not report cases that come under their care. They claim that there is no diphtheria. All the other physicians pronounce all similar cases to be true diphtheria. We do all we can to isolate and protect when we hear of such a case. You undoubtedly have had experience in such cases. Please advise us what course is best to pursue.

Very truly yours,

——————,

For the Board of Health.

In response to this communication a letter was sent from the office of the Board, stating that the safest way would be to consider every case of sore throat in a locality where diphtheria prevailed as suspected diphtheria, and to distribute pamphlets (issued by the State Board of Health) on the restriction of this disease to all the neighbors of those sick. In this way that class of physicians who do not regard the public health will not be depended upon to control public opinion, but after a short time they will be controlled by public opinion.

The local board of health in this locality in which diphtheria so prevailed was advised to meet and pass a resolution, which should stand as one of the "regulations" of the Board that in all cases of inflamed throat, the local board of health, acting on the advice of the State Board, would require physicians and householders to report said cases to the health officer in order that precautions might be taken as in cases known to be diphtheria.

It was pointed out that, while diphtheria is, as a rule, *fatal* to *children* only, it is *spread* frequently by cases in *adults*, because in them the disease is not sufficiently well marked to make ordinary people believe that it is diphtheria.

After the reading of this correspondence, and a discussion of the subject, the preambles and resolutions adopted by the Board in 1882, were amended and adopted as follows:

IN ALL CASES OF SORE THROAT, PRECAUTIONS SHOULD BE TAKEN.

Resolutions Adopted by the Michigan State Board of Health, Jan. 10, 1888:

WHEREAS, It is often difficult to recognize mild cases of diphtheria, or to distinguish such cases from a simple tonsilitis, pharyngitis, or larnyngitis, and

WHEREAS, Such mild cases of diphtheria often communicate a dangerous and fatal form of diphtheria;

Resolved, That it is the duty of physicians and householders in reporting diseases dangerous to the public health, and of local health authorities in their efforts to restrict such diseases, in every case, to give to the public safety the benefit of the doubt, and in localities where diphtheria exists to regard cases of acute sore throat as suspected cases of diphtheria;

Resolved, That suspected cases of dangerous diseases should be reported, and precautionary measures should be taken.

INFLUENCE OF DRESS ON RESPIRATION.

Dr. J. H. Kellogg presented facts and memoranda of a paper, entitled:

"The So-called 'Female Type of Respiration' the Result of Improper Dress, as Shown by the Study of Respiration in Indian and Chinese Women."

This paper embodies the results of the study of respiration in nineteen Chinese women, fifteen Indian women and more than one hundred civilized women, by the aid of the pneumograph. The results show:

First, That there is but one normal type of respiration in human beings, contrary to the views held by our leading physiologists, who assert that normal respiration in adult women is costal, while in males it is of the abdominal type.

Second, That the so-called "male" or abdominal type of respiration is the normal type for both men and women when the movements of the chest and abdomen are not restricted by improper dress.

Dr. Kellogg was requested to complete the paper for the Annual Report of the Board. [A paper on this subject, by Dr. Kellogg, is published in the transactions of the Michigan State Medical Society for 1888, pages 322–343, and several appended diagrams.]

THE SMEAD DRY-CLOSET SYSTEM OF DISPOSAL OF EXCRETA.

Mr. Chairman, Members of the State Board of Health:—

Your committee appointed for the purpose of investigating the Smead System of Dry Closets as used in connection with public schools, would respectfully report as follows:

Pursuant to the instructions of this Board, the committee visited Toledo as requested by Mr. Isaac D. Smead of that place, the committee being accompanied by the Secretary of this Board. In company with Mr. Smead, we visited several school buildings in that city, and carefully examined the system of dry closets in use in them. In all but one building, the working of the system appeared to be very satisfactory, the outside temperature being such as to insure good draft in any heated building provided with an efficient system of ventilation. In one building, the odors present in the basement were, when it was first entered, exceedingly foul, the odors coming chiefly from the urinal. It was necessary to open the basement windows to clear the room, even in part, of the odors present. The fecal matter of the vaults was, in two of the buildings visited, nearly dry; in the building referred to above it was in a soft and highly putrescent condition.

The committee also visited a school building in Detroit in which this system had been recently introduced, but had not been long enough in use to enable us to judge of its efficiency. The conclusions thus far reached by your committee may be briefly stated as follows:

1. The Dry-Closet System as introduced in connection with the Smead-Ruttan system of ventilation, with a sufficiently strong and constant draft, presents features of economy and conveniences which render it worthy of investigation.

2. The apparent success of the system is wholly due to the efficiency of the system of ventilation in connection with which it is introduced.

3. The system presents several features, however, which do not commend it to sanitarians, and which certainly suggest a further study and observation of the system before it can receive scientific endorsement.

a. There is always a possibility, and under some circumstances, as during the prevalence of adverse winds and in hot weather, a probability, of an interference with the ventilating system, by which fecal odors may be carried, by a back draft in the foul-air ducts, into the school rooms.

b. The system does not provide a satisfactory method of caring for the boys' urinal.

c. In the light of the most recent researches, the drying of fecal matters, which is supposed to occur in the dry vault, does not destroy the germs of disease which may be contained in them; and the scattering of these germs, through their discharge into the open air, may be conducive to the wide dispersion of the infectious elements of diphtheria, typhoid fever, and, possibly, other grave maladies. The danger would, of course, be greatly aggravated in times of epidemics of any of these diseases.

4. On the whole, we are obliged to express the opinion that the Dry-Closet System is not in the line of the best sanitary progress.

Your committee wish especially to call attention to the fact that their inquiries thus far have been prosecuted at a season of the year when this system would necessarily appear at its best and when its dangers and disadvantages are least likely to appear; and on this account they desire to withhold their final and complete report upon the Dry-Closet System until they shall have had opportunity to observe its working during the warm season of the year.

Respectfully submitted,
JNO. AVERY, M. D.
J. H. KELLOGG, M. D.

DANGERS IN GASOLINE.

Dr. J. H. Kellogg, who had been appointed a committee to investigate the dangers in gasoline, made a report, embodying facts which he had collected, and including the views of leading insurance agents, etc., concerning the dangers in the use and storing of gasoline, and giving rules to be observed in handling this substance, declared to be "more dangerous than gunpowder." [This circular is printed on pages 24-28 of the Report for 1887.]

REGULAR QUARTERLY MEETING, APRIL 10, 1888.

Members present: Hon. Jno. Avery, M. D., President; Prof. Victor C. Vaughan, M. D.; Arthur Hazlewood, M. D.; J. H. Kellogg, M. D.; Prof. Henry F. Lyster, M. D.; and Henry B. Baker, M. D., Secretary.

At the morning session, besides a large amount of routine work, the Board listened to the reports of committees.

TYPHOID FEVER AT THE STATE INDUSTRIAL HOME FOR GIRLS.

Drs. Kellogg and Vaughan made a report concerning their investigation of the outbreak of typhoid fever at the State Industrial Home for Girls, at Adrian. The outbreak was attributed to the contamination of the air supply of the buildings with sewer gas, and the infection of the sewer system by discharges from a patient sick with typhoid fever, brought there from Sault Ste. Marie. This opinion was based on the testimony of managers and housekeeps and a large number of girls, as well as the personal observation of the committee. There were found to be grave defects in the sewerage system which resulted in a pollution of the air of the whole building, endangering the lives of the inmates. This was probably increased by the stopping up by freezing of a rain-water conductor which was depended upon as a ventilator to the sewer. The water-supply was found to be good. In the sewer air, there was found by Prof. Vaughan a great abundance of bacterial growth; but after the first case the discharges of the typhoid patients had been disinfected, and no typhoid germs were found. Disinfection of the whole sewer system, and opening up of the fresh-air inlets to the buildings was at once recommended by the committee. The outbreak stopped immediately, perhaps because of the disinfection after the first case.

On motion, Dr. Kellogg and Dr. Vaughan were requested to prepare a complete report of the investigation for publication in the Annual Report of the Board. [If received in time this report will be printed further on in this Report.]

COMPENSATION OF HEALTH OFFICERS.

Dr. Hazlewood reported that about 550 responses had been received from health officers, to the circular sent out asking questions concerning the compensation of health officers. So far as the reports had been received, it would seem that very few health officers receive a regular salary, and in most cases where any compensation was received it was declared to be insufficient. As soon as all the reports are in they will be compiled.

THE TYPHOID OUTBREAK AT THE STATE PRISON.

Dr. Vaughan reported that he had found typhoid fever germs in great abundance in the air taken from the sewers at the State Prison at the time of the outbreak of typhoid fever there. The Secretary was authorized to make a final report to the Warden of the State Prison, giving the results of the investigation of that outbreak by the State Board of Health. The final report does not change the recommendations heretofore made. [It will be printed further on in this Report.]

SLAUGHTER HOUSES NEAR THE STATE HOUSE OF CORRECTION AT IONIA.

Dr. Avery presented the report of the committee appointed to investigate the slaughter houses near the State House of Correction at Ionia. [This Report is to be printed further on in this Report.]

DIETARY OF STATE INSTITUTIONS.

The Secretary presented the following resolution which had been received from the Secretary of the State Board of Corrections and Charities, with the statement that the resolution had been passed by that Board at its March meeting:—

Resolved, That the State Board of Health be requested to make general inquiry in regard to the dietary of all State penal, reformatory and charitable institutions, with a view to having the food supplied more thoroughly looked over, and request them to report defects, if any, and make such recommendations as in their opinion would make it proper and suitable.

After the reading of the above request, a motion prevailed that the office of the State Board of Health politely request the different institutions of the State to send to the Secretary of this Board their bills of diet with a statement where the supplies are obtained and what system is used for the inspection of foods.

PLANS FOR A COTTAGE AT NORTHERN ASYLUM FOR INSANE.

At the afternoon session, Dr. James D. Munson, superintendent of the Northern Michigan Asylum for the Insane, was present, to explain the plans for the proposed cottage at that institution. The Board carefully examined these plans. The plans were highly commended by the Board, and Dr. Kellogg was requested to draft a resolution or statement containing the suggestions and recommendations which had been brought out in the course of the examination. [This report will be printed further on in this Report.]

OPINION RELATIVE TO WATER-SUPPLY OF EAST SAGINAW.

A letter was read from Prof. V. C. Vaughan, committee of the State Board of Health, to Hon. John J. Wheeler, president of the Board of Water Commissioners, East Saginaw, giving his opinion concerning the results of the analysis of samples of water from East Saginaw. On motion, the interpretation of analyses given by Dr. Vaughan was endorsed as the opinion of the State Board of Health. Briefly, that opinion was that the water was improved by filtering, and that, considering its source, safety in the use of the water for drinking would be enhanced by boiling it.

SANITARY INSPECTIONS OF POOR-HOUSES, PLANS OF SEWERAGE, ETC., AT STATE INSTITUTIONS.

Dr. Baker offered the following resolutions which had been previously adopted by the State Board of Corrections and Charities:

Resolved, That the Superintendents of the Poor in each county are advised to secure the thorough sanitary examination of their poorhouse, with particular reference to sewerage and water: this examination to be made by the most competent persons they can procure.

Resolved, That the Board of Control of each of the several state institutions be requested to obtain and keep on file in their office a complete plan of the sewerage, drainage and plumbing of their respective institutions.

The above resolutions were unanimously adopted.

AN EPIDEMIC OF PNEUMONIA IN INGHAM COUNTY.

The Secretary read a communication from Dr. C. L. Randall, of Dansville, concerning an epidemic of pneumonia, perhaps complicated with meningitis, in the township of Bunker Hill, Ingham Co., with 22 cases and 5 deaths between Feb. 18 and March 28, 1888. The Board authorized the Secretary to inquire further into the epidemic.

DIPHTHERIA AT LIVONIA, WAYNE COUNTY.

At the request of the health officer of Livonia township, Prof. Henry F. Lyster, M. D., visited that township Feb. 10, as a committee of the State Board of Health to investigate the outbreak of diphtheria there. (Since Dec. 20, sixteen cases and ten deaths had occurred.) The following is his report to the health officer of Livonia township:

DETROIT, *Feb. 11, 1888.*

Lorenzo G. Pierson, Health Officer, Livonia Township:

DEAR SIR:—After my inspection of the cases of diphtheria at Livonia, I can only reiterate now what I said to you during the inspection, that the type of the disease was not worse than it is in Detroit and that the cases are more severe now on account of the cold weather and on account of crowding the cases into unventilated rooms. You should read carefully the printed instructions sent you by the Board in regard to the limitation of diphtheria, and especially prevent visiting between families affected and those not affected. I am quite of the opinion that the disease has been spread around by inconsiderate visiting on the part of those who had been in attendance upon it. This is notably the case in one family. In my opinion the three physicians whom I met in attendance upon their patients were active and on the alert to prevent contagion, and were doing all that could be done to cure their patients.

I would recommend that more attention be paid to ventilation and to disinfection,—the latter to be carried out according to the printed instructions sent you. The rags that are used as handkerchiefs should be burned. The floors should be mopped with solution of corrosive sublimate, one part in 1000, or eight grains to the pint, and the baseboards, doors, sills and wooden furniture washed in the same. A solution of about the same strength should be put in the bed pans and vessels used to receive the discharges from the patients, and the sheets, pillowcases and bedding soaked for washing. A weaker solution (one of about ½ that strength) might be used by the nurse and others in attendance to rinse their hands in after washing them with carbolic toilet soap and using the nail brush.

Three pounds of sulphur might be burned after the method described in the printed papers sent you in any one of the rooms I saw, to disinfect, after the patient has been removed to another room. The doors should be tightly listed up, as the sulphurous acid gas is very irritating to the lungs, even if a small quantity enters the living room. You should discourage gatherings of all kinds. I hear that parties for dancing are not unfrequently held just now and that many quite young persons attend them. These afford an excellent opportunity for the dissemination of this disease.

I do not believe that there is any local reason for this epidemic or that it comes from any water-supply having been contaminated or from any other cause than contagion from one to another. All diseases of this class are more violent in extremely cold weather. While low and damp houses without cellars favor the development of diphtheria, the cases at Livonia occurred in the best constructed houses as well as in the most unsanitary. * * *

* * *

Will you please write me a detailed statement of the names and dates of all the cases and write me regarding any points upon which you desire information. * * *

Please send me word how the present cases get on and about any new ones which may come down.

Very respectfully your obedient servant,

HENRY F. LYSTER.

TYPHOID FEVER CAUSED EXPERIMENTALLY:—WORK IN THE STATE LABORATORY OF HYGIENE

Dr. Vaughan presented a short verbal report of the work done during the quarter in the State Laboratory of Hygiene at the University. During the quarter, dogs and cats had been inoculated with the typhoid germ found in the Iron Mountain drinking water, and a regular run of typhoid fever was produced in the dogs, the same as in man, whereas the cats, when inoculated, died very soon. The inoculation was by a hypodermic syringe into the abdominal cavity. March 5, three dogs were inoculated with the Iron Mountain germ. After the inoculations, the temperature of the dogs was taken for three or four days, and it was found to be normal. No further attention was given to this temperature until the first dog died. In two weeks the dogs were taken sick. One died April 1, twenty-six days after the inoculation, one died April 8, and one will probably get well. The following are the results of the observation of temperature of the dog which died on April 8:

April 3,	at 2 P. M.	105.°
	at 5.30 P. M.	105.6°
April 4,	at 9 A. M.	102.8°
	at 3.30 P. M.	103.°
April 5,	at 10 A. M.	105.°
	at 2.30 P. M.	104.°
	at 5.30 P. M.	103.2°
	at 9.30 P. M.	105.6°
April 7,	at 2.30 P. M.	106.8°
	at 6.30 P. M.	106.8°

On *post-mortem* examination, the mesenteric glands were found to be much enlarged, the regular typhoid lesions were recognized, and in one dog there were five or six ulcers in the intestines.

One dog was inoculated with sterilized culture; and this dog died first, but all the dogs were kept in the same pen, and the bacilli of typhoid were found in his intestines.

March 5, a vicious cat was inoculated with twice the quantity used on a dog; the cat died that night. The germs were found in the intestines; the mucous membrane was destroyed.

Dr. Vaughan spoke of three cases of poisoning in Ann Arbor recently by the roots of the plant known as water hemlock. Children had been gathering artichokes and ate the hemlock roots by mistake. Very little is said by books on toxicology concerning this poison, and there seems to be no chemical tests for it. Mr. Erwin F. Smith has been making a study of the subject, and public attention should be called to this poisonous plant. On motion, Mr. Smith was requested to prepare the results of his study of the subject for publication by the Board.

Dr. Vaughan also stated that a student at the University had been working on the "loco weed" and had obtained an alcoholic extract which kills cats and frogs. This weed grows abundantly in Kansas and Texas, and cattle after feeding upon it for a while prefer it to other food. It soon produces in them a kind of intoxication.

ABSTRACTS OF QUARTERLY REPORTS, PRESENTED BY THE SECRETARY AT REGULAR MEETINGS OF THE BOARD, OF WORK DONE IN THE OFFICE OF THE STATE BOARD OF HEALTH.

REPORT FOR QUARTER ENDING JULY 12, 1887.

The office during the quarter has received information of, and has taken action relative to, nine outbreaks of typhoid fever in Michigan, sixty-five outbreaks of scarlet fever, and forty-nine outbreaks of diphtheria. To such localities there have been sent, for distribution to the neighbors of those sick, about 100 documents on the prevention of typhoid fever; about 900 documents on the restriction and prevention of scarlet fever; and about 700 documents on the restriction and prevention of diphtheria.

During this quarter there has been one case of small-pox in Detroit, and a case of small-pox was reported from Sand Beach, Huron county, which, probably, was not small-pox. Precautionary measures were taken, however, at Sand Beach, and in East Saginaw and Saginaw City, where the young man was taken sick before going to Sand Beach. A case of typhus fever wa recently reported from Detroit.

Since the beginning of the quarter there have been received and entered in the library 110 books and pamphlets, mostly in exchange for publications by this Board. This does not include periodicals, many of which also are received in exchange.

The card catalogue of the library has progressed steadily during the quarter until now it contains over 7,000 cards.

A second demand for return of health officers has been made on delinquent townships, villages and cities. The names and addresses of 1,250 health officers have been received and entered, and documents containing instructions have been sent to each one. A list of these names and addresses has been made for printing.

The circulars and blanks planned for and urging a thorough sanitary survey by means of house-to-house inspections, were sent to mayors and health officers of all the cities in Michigan except a few of the largest, and to presidents and health officers of all villages.

Pamphlet proceedings of sanitary conventions have been distributed.

Facts collected from health officers relative to the experiences of localities with diphtheria, small-pox, glanders, measles and typhoid fever in Michigan in 1886, have been compiled to show the results of certain methods of dealing with these diseases, and to indicate which are the methods which should be more generally adopted.

Reports of sickness in Michigan in 1886 from the most important ordinary diseases have been compiled for comparison with similar statistics of the meteorology for that year, with a view to learning the causes of those diseases.

Records of meteorological observations by observers for this Board have been passed over to the State or to the U. S. signal service, and records of its observers have been received in exchange.

An abstract of the report made April 13, 1887, by Dr. Vaughan on tyrotoxicon and cholera infantum, etc., has been made and submitted to Dr.

Vaughan, and a thousand copies printed, about 800 of which have been sent to the newspapers, sanitary and medical journals, prominent physicians in Michigan, the dairymen, cheese factories, creameries, manufacturers and dealers in dairy supplies.

HEALTH IN MICHIGAN IN THE SECOND QUARTER OF 1887.

Contagious Diseases.

Compared with the preceding quarter (January, February and March), reports from all sources show the number of places at which diphtheria was reported, to have decreased by an average of fourteen places per month, scarlet fever to have decreased by an average of five places per month, typhoid fever to have decreased by an average of six places per month, and measles to have increased by an average of fourteen places per month. One case each of small-pox and typhus fever occurred in the second quarter of 1887. Neither was present in the first quarter of 1887.

Meteorology and Sickness from all Causes Compared with Preceding Quarter.

A comparison of the meteorological conditions of the second quarter of 1887, with the meteorological conditions of the first quarter, shows the temperature to have been much higher, the absolute humidity much less, the relative humidity much more in the second quarter than in the first, and the day and night ozone about the same in the second quarter as in the first quarter of 1887.

Compared with the preceding quarter (January, February and March), the reports received from regular observers indicate a marked increase of cholera morbus and intermittent fever, and a marked decrease of influenza, pneumonia, tonsilitis and bronchitis, in the second quarter of 1887.

Meteorology and Sickness Compared with Preceding Nine Years, 1879-87.

A comparison of the meteorological conditions of the second quarter of 1887, with the average of the corresponding quarters in the nine years, 1879–1887, shows that in 1887 the temperature and the day ozone were about the same, the absolute and the relative humidity were slightly more and the night ozone was less than in the average second quarter of the nine years.

Compared with the average for the corresponding quarter in the nine years, 1879-1887, the reports received from regular observers indicate that intermittent fever, remittent fever, consumption of the lungs, diphtheria, scarlet fever, pneumonia and bronchitis were less prevalent in the second quarter of 1887, and that there was no disease much more than usually prevalent in that quarter.

REPORT FOR QUARTER ENDING OCT. 11, 1887.

The office during the quarter has received information of, and has taken action relative to 59 outbreaks of typhoid fever in Michigan, 40 outbreaks of scarlet fever, and 78 outbreaks of diphtheria. To such localities there have been sent for distribution to the neighbors of those sick about 600 documents on the prevention of typhoid fever; about 600 documents on the restriction and prevention of scarlet fever; and about 1,200 documents on the restriction and prevention of diphtheria.

The usual office work preliminary to three sanitary conventions—at Traverse City, Owosso, and Albion—has been nearly completed.

The printed proceedings of the last regular meeting of the Board, in July, have been sent to health officers of cities and villages; also the documents on cholera infantum and typhoid fever. The proceedings of the board have been sent to 286 health officers of townships, and the document on cholera infantum has been sent to 976 health officers of townships. The printed list of health officers has been sent to every township, village, and city in the State. For those localities which had not returned health officers, the list was marked, so as to call attention to the delinquency, and it resulted in filling a large number of the blanks.

The proceedings of the last regular meeting, and the document on cholera infantum were sent to 491 teachers and prominent educators in Michigan, together with a circular letter and blank for replies relative to designs for model rural school-houses.

As fast as health officers' names have been returned, documents have been sent to give instruction in the work of health officers and local boards, not only to the health officers, but to clerks and presidents of local boards, whose names and addresses were signed to the returns of health officers.

Three copies of the document on typhoid fever were sent to each of 50 presidents of boards of water commissioners of cities. They were sent also to presidents of villages.

The July proceedings of the Board were sent to the sanitary journals and exchanges of the Board.

A monthly summary of meteorological conditions at this station has been sent each month to the Chief Signal Officer at Washington.

The tables and diagrams for the article on meteorology for the year 1886 were completed, and the compiling for the year 1887 begun, and nearly completed up to August.

During the quarter there have been added to the library 221 books and pamphlets, which were mostly received in exchange for documents of the Board.

The following interesting letter received during the quarter has been ektographed and sent where it was thought it would do good:—

BRIGHTON, Mich., Aug. 23, 887.

Dr. Baker, Secretary, State Board of Health:—

DEAR SIR:—During the fore part of the present summer a young man (aged 18) whose home was in this place, but who had been employed in the drug house of Geo. E. Davis at Detroit for the past year, was taken sick and died in one week.

The body was brought home and arrangements made for the funeral. The scholars in our public school, of which he had been a member, were invited to attend in a body.

Prof. Kellogg, the principal, counselled me with regard to the propriety of taking the school to the house, and I investigated the case.

Upon the box containing the casket was a certificate stating that the patient died of "Heart clot," and signed by Dr. Duffield, Health Officer of Detroit.

Making inquiries among friends I learned that the physician attending had called the disease "putrid sore throat," "gangrenous sore throat" and "ulcerative tonsillitis," giving the different names at different times. The father reached Detroit Friday afternoon when the doctor told him his son was in no danger of dying, if he only would take tonics and food enough to keep up his strength; this when he had been sick but about four or five days and was able to be out of bed. Early Sunday morning the patient died, and the Dr. said he could not account for his sudden death, unless a "heart clot" had formed, as he died from heart failure. He assured the father that there was no danger in taking the body home, as he had no diphtheria, "There was no membrane visible."

Learning these facts, I strongly advised against the school or any other children attending the funeral, or visiting the house. For this counsel I got some pretty severe criticism for daring to question the certificate of the health officer of Detroit. Twenty days ago the good lady with whom the young man boarded at Detroit and at whose house he died, made a visit to the afflicted family at Brighton, and brought some clothes and other articles that belonged to the dead boy. Being so well assured that there was no danger, no effort was used to protect the remaining children from exposure by the clothes. Ten days later two children of the family were taken with a virulent type of diphtheria, and to-day one of them died (aged 8) and the other (aged 6) will hardly recover. The father remarked to Dr. McHench, "If these children have diphtheria, then my boy had it, for it is the same thing."

I firmly believe that the young man died at Detroit with diphtheria, (this is also Dr. McHench's opinion) and that the poison which caused the present outbreak was brought here in the clothes.

I do not rembember the name of the doctor who attended him, but he was recommended by Mr. Geo. E. Davis, and is said to be an intelligent physician. * * * * Respectfully yours,

C. B. Wiley, *Health Officer, Brighton.*

P. S.—I learn that several members of the family in which young Reiner died, at Detroit, have had quite bad sore throats since his death. The name of the attending physician is * * * *

CONDITION OF HEALTH IN MICHIGAN IN THE THIRD QUARTER OF 1887.

Contagious Diseases.

Compared with the preceding quarter (April, May and June), reports received from all sources show the number of places at which diphtheria was reported, to have increased by an average of fourteen places per month, scarlet fever to have decreased by an average of thirteen places per month, typhoid fever to have increased by an average of twenty-nine places per month, and measles to have decreased by an average of twenty-seven places per month. Small-pox and typhus fever (one case of typhus, and two of small-pox) were reported at one place in both the second and the third quarters of 1887.

Meteorology, and Sickness from all Causes, Compared with the preceding Quarter.

A comparison of the meteorological conditions of the third quarter of 1887, with the meteorological conditions of the second quarter shows the temperature to have been much higher, the absolute humidity to have been more, the relative humidity to have been slightly more and the day and the night ozone to have been about the same in the third quarter as in the second quarter of 1887.

Compared with the preceding quarter (April, May and June), the reports received from regular observers show a marked increase of diarrhea, cholera morbus, dysentery, cholera infantum, typho-malarial fever, typhoid fever, and remittent fever, and a marked decrease of pneumonia, measles, bronchitis, influenza, tonsilitis, rheumatism, neuralgia, consumption of lungs, erysipelas and inflammation of kidney in the third quarter of 1887.

Meteorology and Sickness, Compared with Nine Years, 1879-1887.

A comparison of the meteorological conditions of the third quarter of 1887, with the average of corresponding quarters in the nine years, 1879–1887, shows that in 1887 the temperature and the absolute humidity were about the same, the relative humidity was slightly more, and the day and the night ozone were considerably less than in the average third quarter of the nine years.

Compared with the average for the corresponding quarter of the nine years, 1872–1887, the reports received from regular observers indicate that intermittent fever, consumption of lungs, remittent fever, diphtheria, and scarlatina were less prevalent in the third quarter of 1887, and that there was no disease much more than usually prevalent in that quarter.

REPORT FOR QUARTER ENDING JANUARY 10, 1888.

To the President and Members of the Michigan State Board of Health:

GENTLEMEN,—An abstract of the proceedings of the October meeting of this Board was printed and sent to sanitary and medical journals, which exchange with this office, editors of newspapers, and others.

During the past quarter, the correspondence, exclusive of postal cards, hektograph letters, etc., covers about 600 pages of the letter book.

The office, during the quarter, has received information concerning, and has taken action relative to, 38 outbreaks of typhoid fever, 53 outbreaks of scarlet fever, and 94 outbreaks of diphtheria.

To such localities there have been sent, for distribution to the neighbors of those sick, about 500 documents on the restriction of typhoid fever, 600 on the restriction of scarlet fever, and about 1,500 on the restriction of diphtheria.

Eight thousand copies of the pamphlet on the restriction and prevention of diphtheria have been printed from plates.

Eighty-four books and pamphlets have been received and placed in the library of the Board during the past quarter—most of them in exchange for the publications of this Board.

Since the last meeting of the Board two sanitary conventions have been held, one at Owosso, and one at Albion. Both of these conventions were well attended; at the evening sessions of the Albion convention fully 700 persons being in attendance. At these conventions nearly 300 sets of small pamphlets and nearly 200 larger pamphlets were distributed.

A circular letter and blank for annual report have been sent to health officers and clerks of cities, villages and townships in Michigan. Jan. 9, 239 reports of health officers, and 308 reports of clerks had been received, and they are coming in more promptly and rapidly than ever before.

There were also sent to the clerks blanks for the report of names and addresses of resident medical practitioners, as required by the law of 1887. Two hundred and fourteen of these reports have been received.

During the quarter 1,200 pages of hektograph work have been made. Among these were the following circulars:—

HOW SCARLET FEVER COMES TO MICHIGAN.

The Michigan State Board of Health has received information from Dr. Sifton, health officer of Sutton's Bay township, which illustrates, in a striking way, how this country gets contagious diseases from the old countries. October 2, 1887, a family arrived in Sutton's Bay, Leelanaw county, direct from Norway. The family came over in the S. S. Ohio, of the Inman line, reaching New York Sept. 30. Scarlet fever was on board the steamer during the passage, one child dying before the landing, and "several more were sick in the same way." One child of this family was taken sick with scarlet fever the day after reaching New York. The family, however, proceeded over the New York Central and the Lake Shore & Michigan Southern, to Michigan; then over the Detroit, Grand Haven & Milwaukee, and the Grand Rapids & Indiana, to Traverse City; then to Sutton's Bay. Another child of the family has since come down with the disease. The family had a certificate, signed by the surgeon of the steamer, that they had been protected by vaccination against small-pox; so they passed without detention the quarantine authorities at the port of New York, after they had been exposed to a contagious disease which causes more deaths by far in this country than small-pox causes.

QUARANTINE DOES NOT DEAL WITH THE MOST DANGEROUS DISEASES.

Relative to the persons who brought scarlet fever to Sutton's Bay, Mich., and who came on the S. S. Ohio, reaching New York Sept. 30, 1887, Dr. Wm. M. Smith, health officer of the port of New York, says:—

"Developed cases of diphtheria and scarlatina arriving on vessels at this port are removed to Ward's Island. It is impossible under the law for the Health Officer or the authorities at Castle Garden to quarantine persons who have been exposed to the contagion of those diseases, consequently the sick on board vessels during the voyage, doubtless, often infect the relatives or those with whom they come in contact * * * * and who carry the latent contagion to interior communities. I would be glad if the law allowed those exposed to the contagion of these diseases to be held for observation as is the case when persons are exposed to the contagion of small-pox."

The instance mentioned above is an illustration of what Dr. Smith says,—the child having been exposed during the voyage and taken sick with scarlet fever the day after arrival at New York; so the infected child went on its way, to spread scarlet fever. In Michigan at least, ten times as many deaths occur from either scarlet fever or diphtheria as from small-pox.

Is it not time that the whole subject of quarantine was investigated by the States, and by the United States Government, with a view to protecting the people of this country from the introduction of the really dangerous diseases? HENRY B. BAKER, Secretary.

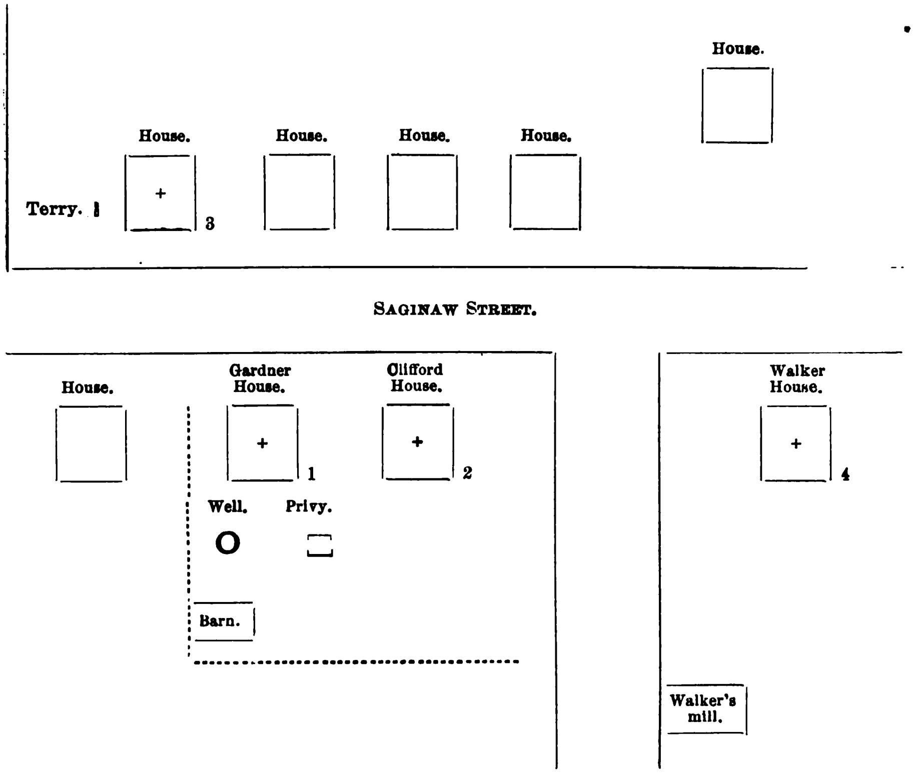
Office of the Secretary of the Mich. State Board of Health,
Lansing, Mich., Nov. 3, 1887.

HOW TYPHOID IS SPREAD, AND HOW IT MAY BE PREVENTED.

Lapeer, Mich., October 31, '87.

DR. BAKER:—Enclosed find a short report of Typhoid cases occurring in the southern part of our town. Houses marked + are the ones in which cases occurred. Nos. 1, 2, 3 and 4, order of outbreak. Cases in 2, 3 and 4, traceable to water from well in rear of No. 1.

Respectfully, H. McCOLL.



Typhoid Fever Cases in Lapeer City, with Sources of Contagion.

About September 1, '87, Myron Gardner, railroad employé, came from the South sick with fever to his father's home, No. 1 on diagram. His case was supposed to be Malarial.

No care was exercised with stools in the way of disinfection, but they were thrown into privy vault in rear of house, and in close proximity to well. Wash water was thrown on the surface of the ground, which was very dry at the time. About 7th or 8th of September a copious rain fell and soaked the sandy soil, and on the 14th Wm. Gardner and wife, father and mother of Myron, and E. D. Gardner, a brother, (who was a student in my office) and who boarded at home, were attacked with fever. On this day I got home from Washington, and found four of them down with a severe type of typhoid fever, and in two weeks Myron's wife and child were attacked. Also a child across the street at Terry's, who had used water from the Gardner well. About the same time three cases in the Clifford house, south of Gardner's, who also used water from the Gardner well. None of the people from either of these houses were in the Gardner house. In the Walker house, still farther south, one case has occurred, and I was at a loss to account for this case till a few days ago, when the young man said that at the mill where he was working they had used the Gardner water for a few days, owing to disarrangement of the pump at the mill. Two others of the mill hands—Anderson and Lester—who used the same water, were attacked about the same time. Lester is now convalescent. Anderson is dead, as also the child at Terry's. When I took charge of the cases I ordered the discontinuance of water from the Gardner well, and the disinfection of the stools, and no new cases are now reported. People who assisted to take care of the Gardner and other families, and who use water from other sources, have not been attacked. Clearly, Myron Gardner brought the fever home, the well became infected after the first rain from slops and privy, and the other cases got their seed from the water. Yours truly,

H. McColl.

The foregoing instructive account of the way typhoid fever was spread, in one instance, is reproduced in the hope that it may lead others to trace the spread of this important disease, and, what is of greater importance, act intelligently for the prevention and restriction of the disease, as Dr McColl did in this instance. Very respectfully,

Henry B. Baker, Secretary.

Office of the Secretary, State Board of Health,
Lansing, Mich., Nov. 2, 1887.

HEALTH IN MICHIGAN IN THE FOURTH QUARTER OF 1887.

Contagious Diseases.

Compared with the preceding quarter (July, August and September), reports received from all sources show the number of places at which diphtheria was reported, to have increased by an average of eight places per month, scarlet fever to have increased by an average of nine places per month, typhoid fever to have decreased by an average of two places per month and measles to have increased by an average of one place per month. One case of small-pox was reported in each quarter.

Meteorology, and Sickness from all Causes, Compared with the Preceding Quarter.

A comparison of the meteorological conditions of the fourth quarter of 1887, with the meteorological conditions of the third quarter shows the temperature to have been much lower, the absolute humidity and the day ozone less, the relative humidity more and the night ozone slightly more in the fourth quarter of 1887.

Compared with the preceding quarter (July, August and September), the reports received from regular observers show a marked increase of pneumonia, bronchitis, influenza, tonsilitis, scarlet fever, diphtheria, rheumatism and consumption of the lungs, and a marked decrease of diarrhea, cholera morbus, dysentery, cholera infantum, intermittent fever and whooping-cough in the fourth quarter of 1887.

Meteorology and Sickness, Compared with Nine Years, 1879–1887.

A comparison of the meteorological conditions of the fourth quarter of 1887, with the average of corresponding quarters in the nine years, 1879-1887, shows that in 1887 the temperature, the absolute and relative humidity were slightly less, and that the day and the night ozone were less than in the average fourth quarter of the nine years.

Compared with the average for the corresponding quarter in the nine years, 1879–1887, the reports received from regular observers indicate that intermittent fever, typho-malarial fever, consumption of lungs, and diphtheria were less prevalent in the fourth quarter of 1887, and that no disease was much more than usually prevalent in that quarter.

This statement is for the State of Michigan as a whole; in certain localities there has been more, and in other localities less sickness than is usual.

TYPHOID FEVER IN MICHIGAN IN 1887 AND PREVIOUS YEARS.

Owing to the greatly diminished rainfall during the spring and summer of 1887, and the consequent lowering of the water in streams, ponds, and wells, a marked increase in the prevalence of typhoid fever was feared, and unusual efforts were put forth by the office of the State Board of Health for the prevention and restriction of the disease. The increase did not take place quite as early as expected, but an examination of the following tables will afford a useful means of comparison of the sickness from typhoid fever by months in 1887, with that of 1886, 1885, and the average for the nine years 1878–'86, and for the ten years 1878-'87. The rainfall for the same periods of time is also shown. The changes in the level of the ground water by months for 1887 and for each of the two preceding years are also shown.

RAINFALL IN MICHIGAN.—*Average number of Inches, by Months, for the Nine Years 1878–86, and for the Ten Years 1878–87, also in 1885, 1886, and in 1887.*

Period of time.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 10 years, 1878-87	2.09	2.89	2.28	2.49	3.52	4.24	3.44	3.21	3.72	3.45	2.98	2.69
Av. 9 years, 1878-86	2.07	2.72	2.40	2.59	3.66	4.41	3.55	3.34	3.82	3.56	3.08	2.71
1885	2.70	.73	.58	2.47	2.30	6.01	2.52	5.82	3.75	3.08	2.90	2.14
1886	3.05	1.72	2.74	2.40	2.58	2.29	1.36	4.21	5.36	1.97	2.35	2.13
1887	2.27	4.47	1.18	1.54	2.25	2.76	2.46	1.98	2.84	2.48	2.10	2.55

The rainfall for the third quarter of 1887 was 3.15 inches less than for the corresponding third quarter in the nine years 1878–1886, 3.37 inches less than in 1886, and 4.53 inches less than in 1885. If we add the month of June to the quarter for the purpose of comparison of rainfall, that of 1887 is 4.80 inches less than the average for the nine years, 2.90 inches less than that of the corresponding months in 1886, and 7.78 inches less than the corresponding months in 1885.

The rainfall for the fourth quarter of 1887 has been 2.22 inches less than for the corresponding fourth quarter in the nine years 1878–86, .68 inches more than that in 1886, and .99 inches less than that in 1885.

GROUND-WATER.—*Inches of Earth above the Water—Average by Months for the two Years, 1885-86, for the three Years, 1885-87, and for each of the three Years, 1885, 1886, and 1887, at two Stations in Michigan.*

Period of Time.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average 3 years, 1885-87....	247	245	241	234	239	237	240	246	248	249	248	251
Average 2 years, 1885-86....	244	244	241	234	235	237	240	245	243	245	247	248
1885........................	249	250	246	236	238	239	242	241	238	241	241	240
1886........................	239	237	235	232	231	234	238	248	248	249	253	255
1887........................	259	248	243	244	249	248	257	254	256	256	259	257

The evidence in this table relative to ground water has not as extensive a base as desired, but it is given as the best available and for what it is worth. The number of wells is only two, but the measurements are believed to be accurate, and the wells are near the center of the State, one of them at Lansing, being distant from any other well, and no water being drawn from it, is believed to be especially useful as indicating the changes in the level of the ground water.

In studying the table the fact must be held in mind that the water is lowest when the figures in the table showing the "inches of earth above the water" are greatest.

It may be seen that the water in wells was lower in the early part of 1885 than in the early part of 1886, and that the typhoid fever was more prevalent in the early part of 1885 than in the corresponding months of 1886. The water in wells for the early months of 1887 is shown to be lower than in those months in 1886, and typhoid fever is shown to be more prevalent in the early part of 1887 than in the early part of 1886. In the third quarter of 1887 there is shown a lowering of the water in wells compared with that in the corresponding quarter of 1885 and 1886, and there is shown an increase of typhoid fever in the third quarter of 1887, compared with the third quarter of 1885 and 1886.

In the fourth quarter of 1887 the water in wells was slightly lower than in the third quarter, and lower than in the corresponding quarter in the preceding two years. The sickness reported from typhoid fever was as shown below.

TYPHOID IN MICHIGAN.—*Average per cent of weekly card-reports stating the presence of* TYPHOID FEVER *by Months in the Nine Years, 1878-86, and in the Ten Years, 1878-87, also by Months in 1885, 1886 and 1887.*

Period of Time.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 10 years, 1878-87.......	11	9	7	5	5	6	7	14	20	21	20	14
Av. 9 years, 1878-86........	11	9	7	6	5	6	7	13	20	22	20	15
1885........................	11	7	5	4	3	5	5	6	11	13	16	8
1886........................	6	3	4	3	5	4	5	13	16	16	13	10
1887........................	8	9	7	3	3	5	6	14	23	16	16	12

During the third quarter of 1887, 59 outbreaks of typhoid fever were reported and acted upon; during the fourth quarter the number reported was 38.

By comparing the per cent. of reports of typhoid fever in Michigan in the fourth quarter of 1887, with the figures for the fourth quarter of 1886, an increase of two per cent appears, and when compared with the fourth quarter of 1885 there is shown an increase of three per cent.

By comparing the per cent of reports of the presence of typhoid fever in the fourth quarter of 1887 with that of the fourth quarter in the nine years 1878–'86, there is shown to be a decrease of four per cent in the reports for 1887.

Notwithstanding the continued low water in the wells in the fourth quarter of 1887, the reports indicate a decrease of typhoid fever compared with the *last month* of the preceding quarter; and, although there was reported lower water and more typhoid fever than in the corresponding quarter in 1885 or 1886, as shown above, there was not reported nearly as much typhoid fever in the last quarter of 1887, as the average last quarter for the nine preceding years. while it is believed (the evidence in the tables does not go back so far) that the water in wells was lower than the average for the nine years.

In this connection it may be mentioned that, during the past nine years, a number of cities have secured a general water-supply, and the use of water from many foul wells has been discontinued; and that during the latter part of 1887 a large number of small pamphlets giving directions how to restrict and prevent typhoid fever were sent out by the State Board of Health for distribution to the neighbors of those reported sick of that disease; during the third quarter of 1887 about six hundred, and during the last quarter, about five hundred such pamphlets were thus sent, in addition to a previous general distribution of the document to health officers and others throughout the State. It is quite possible that the typhoid fever has been less than it otherwise would have been. It is proper to bear in mind, however, that during the earlier years the weekly card-reports to the State Board of Health were not as now confined to cases under the reporter's own observation; but this may have been counterbalanced by another exceptional circumstance mentioned below.

It should be understood that what has been said of typhoid fever relates to that disease in the State considered as a whole; in certain localities there has been more, and in certain localities less typhoid fever than usual. Not all the cases of typhoid fever are yet reported to the State Board of Health; reports are made by health officers and other physicians in active practice in different parts of the State; probably an average of the sickness in the State is reported, and if so the sickness reported in one year may be compared with that reported in another, unlsss exceptional circumstances interfere. One other exceptional circumstance should be mentioned,—from and after April, 1886, when the State Board of Health issued a circular to the physicians in Michigan, attention of physicians has been specially called to typhoid fever as a disease which "should be reported to the health officer, the same as small-pox, scarlet fever or diphtheria."

REPORT FOR QUARTER ENDING APRIL 10, 1888.

The office during the quarter has received information concerning, and taken action relative to 49 outbreaks of typhoid fever, 94 outbreaks of scarlet fever, and 93 outbreaks of diphtheria. To such localities there have been sent, for distribution to the neighbors of those sick, about 490 documents on the restriction and prevention of typhoid fever, about 940 documents on the restriction and prevention of scarlet fever, and about 930 documents on the restriction and prevention of diphtheria. Measles has been unusually prevalent during the quarter,—over 69 outbreaks having been reported to this office. Probably a much smaller proportion of the outbreaks of this disease has been reported than of the other communicable diseases mentioned above, because precautionary measures are not so frequently taken in this disease and the Board has not yet issued a pamphlet on its restriction and prevention,—thus not having made such a special effort to get into communication with localities where the disease prevails.

The Secretary visited Manistee as a committee of the Board and with a committee of citizens of Manistee made arrangements for a Sanitary Convention which will be held in that place, June 5 and 6, 1888.

The proceedings of the Sanitary Convention at Traverse City have been printed and will soon be ready for distribution. The proceedings of the Owosso Convention are ready to send to the printer; but are waiting for the State printers to recover from the recent strike.

The printed proceedings of the last meeting of this Board, together with the reprints of the Report, by Dr. Vaughan, of the Laboratory of Hygiene and the Report on Dangers of Gasoline were sent to sanitary journals and exchanges, secretaries of State Boards of Health, meteorological observers, health officers of cities and villages, the State Oil Inspector and his deputies, 200 insurance agents, editors of newspapers, secretaries of State medical societies, etc.

A printed letter has been sent to each health officer in the State (1,318) enclosing a printed postal blank to be filled out and returned to Dr. Hazlewood, answering questions concerning the compensation of health officers.

A circular letter and blank for making a sanitary survey have been sent to the health officers of cities and villages. This revised circular letter requests the health officer to urge the necessity of this survey, in his annual or special report to the local board.

The regular annual blanks have been sent to the supervisors of townships, the presidents and clerks of villages, the mayors and clerks of cities for the return of names of health officers appointed this spring.

Blanks for a list of medical practitioners have been sent to the supervisors of townships, the presidents of villages and the mayors of cities. (The law requires all supervisors to make a report of them, and to file it with the city, village or township clerk.)

One hundred copies of a paper on house-drainage, by Wm. Paul Gerhard, C. E., have been received and distributed. Part of them have been sent to Superintendents of State Institutions, and to members of their boards of control.

During the quarter, 64 books and pamphlets have been added to the Library of the Board.

The regular bulletins of health in Michigan have been issued, and work has been begun on the compilation of the weekly reports of diseases for 1887.

The regular monthly summary of meteorological conditions has been sent to the Signal Officer at Washington, and the data for the principal meteorological conditions in Michigan for the year 1887 have been tabulated.

During the quarter there have been received records of medical practitioners of 437 cities, villages and townships; also 427 annual reports of health officers, and 362 annual reports of clerks. In all there have been received during the year (1888) 666 annual reports of health officers and 670 annual reports of clerks of local boards of health. These reports have been compiled, so far as relates to cases and deaths from diphtheria, scarlet fever and typhoid fever.

The weekly and special reports received during the year 1887 concerning diphtheria have been nearly all tabulated.

During the three months, 18 diagrams have been made in photo-engraving ink,—illustrating papers read before sanitary conventions, also the relation between certain diseases and meteorological conditions.

The amount of hektograph work done covers 992 pages. Among the documents hektographed were papers entitled:—

"Diphtheria at Livonia, spread from person to person."

"Now is a good time to be vaccinated," and

"Typhoid fever attributed to bad water."

One of these circulars was as follows:

NOW IS A GOOD TIME TO BE VACCINATED.

In accordance with the agreement entered into by the State and Provincial Boards of Health, the Michigan State Board of Health has been receiving notices lately of the occurrence of small-pox in different States of the Union. Although not prevalent, except in California, this seems to be a year of its wide distribution, small-pox having been reported since Jan. 1, 1888, in Connecticut, New York, Delaware, Ohio, Indiana, Michigan, Wisconsin, Iowa, six places in California, Tennessee, and Louisiana. Vaccination and revaccination are preventives of small-pox, and if people keep thoroughly protected in this way no epidemic of the disease can occur. Now is the time for those who have not been vaccinated or revaccinnated within the last five years, to take this precaution.

Office of the Michigan State Board of Health, Feb. 22, 1888.

HENRY B. BAKER,
Secretary.

These circulars were largely distributed through the press and otherwise.

Notes taken at the Jackson prison, during the examination of that institution by the Board, have been hektographed and sent for correction to members of this Board, and the authorities at the prison.

About fifty tables have been made comparing meteorological conditions with intermittent fever in Michigan, in the U. S. troops, the British troops in India, and elsewhere, with the view of learning the conditions favoring the occurrence of this disease.

The annual report for 1886 has been printed, with the exception of the index which is ready, and will probably be printed as soon as the new hands in the State printing office are ready to go on with it.

HEALTH IN MICHIGAN IN THE FIRST QUARTER OF 1888.

Contagious Diseases.

Compared with the preceding quarter (October, November, December, 1887), reports received from all sources show the number of places at which diphtheria was reported, to have decreased by an average of twelve places per month, scarlet fever to have decreased by an average of ten places per month, typhoid fever to have decreased by an average of twelve places per month, and measles to have increased by an average of twenty places per month. Small-pox was reported at one place in each quarter.

Meteorology, and Sickness from all Causes, Compared with the Preceding Quarter.

A comparison of the meteorological conditions of the first quarter of 1888, with the meteorological conditions of the preceding quarter shows the temperature to have been much lower, the absolute humidity to have been much less, the relative humidity and the day ozone to have been about the same, and the night ozone slightly less in the first quarter of 1888.

Compared with the preceding quarter (October, November, and December, 1887), the reports received from regular observers show a marked increase of pneumonia, influenza, bronchitis, measles, and tonsilitis, and a marked decrease of diarrhea, typho-malarial fever, dysentery, remittent fever and typhoid fever in the first quarter of 1888.

Meteorology and Sickness, Compared with Nine Years, 1879-1887.

A comparison of the meteorological conditions of the first quarter of 1888, with the average of the corresponding quarters in the nine years, 1879-1887, shows that in 1888 the temperature was slightly lower, the absolute humidity slightly less, the relative humidity about the same, the day ozone less, and the night ozone considerably less in the first quarter of 1888.

Compared with the corresponding quarter in the nine years, 1879-1887, the reports received from regular observers indicate that measles was more than usually prevalent, and that diphtheria, intermittent fever, consumption of the lungs, whooping-cough, pneumonia, scarlet fever and typho-malarial fever were less prevalent in the first quarter of 1888.

These statements are for the State of Michigan as a whole; in certain localities there has been more, in other localities less sickness than usual.

This Sixteenth Annual Report is respectfully submitted.

HENRY B. BAKER,
Secretary.

HENRY F.
VAUGHAN
LIBRARY

PRINCIPAL METEOROLOGICAL CONDITIONS IN MICHIGAN IN 1887.

A COMPILATION OF REPORTS BY OBSERVERS FOR THE STATE BOARD OF HEALTH AND FOR THE UNITED STATES SIGNAL SERVICE.

COMPILED UNDER THE DIRECTION OF THE SECRETARY OF THE STATE BOARD OF HEALTH.

For each of the years 1877 to 1886, inclusive, there has been published in the Annual Reports of this Board a summary relative to the principal meteorological conditions as observed during the year. This paper continues the subject for the year 1887. The names of the observers for 1887 and the months for which copies of their registers of meteorological conditions were received from each are stated in Exhibit 1, page 2. In Exhibit 2, page 3, is given the latitude, longitude, and elevation of each station. In the tables which follow, reports received from any observer for less than half the year have not been used.

The principal conditions treated in the following tables are temperature and humidity of the air, cloudiness, fogs, rainfall, ozone, velocity and direction of the wind, and pressure of the atmosphere. The tables on each subject are illustrated by diagrams representing to the eye variations in the given condition from month to month through the year, at the several localities represented.

These tables give not only meteorological conditions for the year and month under consideration, but they also contain, for purposes of comparison, statements of the average conditions for the longest period available in each case.

In the latter part of the Report for 1886, there was published an article on "The Causation of Pneumonia," in which extensive use was made of meteorological statistics, especially those relating to the meteorology of Michigan. In the last report (for 1887) in an article on "The Causation of the Cold-weather Diseases," influenza, tonsilitis, bronchitis, scarlet fever, diphtheria, and small-pox are proved to sustain very close relations to meteorological conditions. Extensive use of meteorological and sickness statistics is made further on in this Report in an article entitled "The Relations of Certain Meteorological Conditions to Diseases of the Lungs and Air-passages."

The article in this Report in relation to "Causes of Diseases," based upon weekly reports of sickness in Michigan, may well be studied in connection with this article, the main purpose of which is to serve as a basis for studies of the causes of diseases.

EXHIBIT 1.—*Names of observers whose Reports are summarized in the following Meteorological Tables and Diagrams, their Places of Observation, and the Counties and Geographical Divisions of the State in which these Places are situated, and months for which reports were received from each observer.*

Name of Observer.	Place of Observation.	County.	Divisions of the State.*	Months (inclusive) for which Registers were received.
Frank E. Wood	Ripley	Houghton	U. P.	January to May.
J. G. Johnston	Ripley	Houghton	U. P.	August and September.
W. W. Dent, Sergt. Signal Corps, U. S. A.	Marquette	Marquette	U. P.	January to December.
Arthur Beebe	Gulliver Lake	Schoolcraft	U. P.	January to December.
Titus S. Townsend, Corp'l Signal Corps, U. S. A.	Escanaba	Delta	U. P.	January to July.
George Hass Hagan, Signal Corps, U. S. A.	Escanaba	Delta	U. P.	August to November.
John J. Stephenson, Signal Corps, U. S. A.	Escanaba	Delta	U. P.	December.
S. E. Wait	Traverse City	Gd. Traverse	N. W.	January to December.
Geo. M. Chappel, Corp'l Signal Corps, U. S. A.	Mackinaw City	Cheboygan	N.	January to July.
F. B. Millar, Signal Corps, U. S. A.	Mackinaw City	Cheboygan	N.	August to December.
James J. Fitz Gerald, Sergt. Signal Corps, U. S. A.	Alpena	Alpena	N. E.	January to December.
D. W. Mitchell, M. D.	Harrisville	Alpena	N. E.	January to December.
Joseph E. Mueller, Sergt. Signal Corps, U. S. A.	Grand Haven	Ottawa	W.	January to December.
John W. Kimball	Port Austin	Huron	B. & E.	June to December.
Wm. M. Edmondson, Sergt. Signal Corps, U. S. A.	Port Huron	St. Clair	B. & E.	Jan. to July and Dec.
J. W. Johnson, Sergt. Signal Corps, U. S. A.	Port Huron	St. Clair	B. & E.	August to November.
John S. Caulkins, M. D.	Thornville	Lapeer	B. & E.	January to December.
Prof. R. C. Kedzie	Agr'l College	Ingham	C.	January to December.
Prof. J. W. Ewing	Ionia	Ionia	C.	January to June.
Prof. W. D. Clizbe, Supt	Ionia	Ionia	C.	November & December.
Harry S. Bartholomew	Office State B'd of Health, Lansing	Ingham	C.	January to December.
G. G. Gordon, M. D.	Swartz Creek	Genesee	C.	January to September.
Milton Chase, M. D.	Otsego	Allegan	S. W.	January to December.
Prof. M. W. Harrington	Ann Arbor	Washtenaw	S. C.	January to December.
J. H. Kellogg, M. D.	Battle Creek	Calhoun	S. C.	Jan., Feb. to Dec.
Lieut. A. H. Boies	Hudson	Lenawee	S. C.	January to December.
Geo. C. Palmer, M. D., Supt.	Asylum for Insane at Kalamazoo	Kalamazoo	S. C.	January to December.
W. T. Drake	Marshall	Calhoun	S. C.	January to December.
Lewis Marvill	Parkville	St. Joseph	S. C.	January to December.
S. Alexander	Birmingham	Oakland	S. E.	January to December.
F. W. Conrad, Sergt. Signal Corps, U. S. A.	Detroit	Wayne	S. E.	Jonuary to December.

---

* The counties in each division are stated in Exhibit I, in the article on weekly reports of sickness.

EXHIBIT 2.—*Latitude and Longitude, Elevation above Sea Level, and the Average Temperature, and Average Barometric Pressure in 1887, at 15 Meteorological Stations in Michigan—the names of the Stations being arranged in order by latitude, highest first.*

Localities in order of Latitude, those farthest North, first.	Latitude North.	Longitude West from Greenwich.	Altitude (Approximate) above Sea Level,—Feet.	Height of Mercury in Cistern of Barometer above Sea Level,—Feet.	Average Temperature, 1887, Degrees Fahr.	Average Atmospheric Pressure, 1887. Inches of Mercury corrected for Temp.
Ripley	47°7′	88°31′	a 670	....	....	....
Marquette	46°34′	87°24′	641.42	672	38.97	29.268
Gulliver Lake	45°59′	86°1′	e 618.	f 621.	40.03	....
Escanaba	45°48′	87°5′	k 587.699	608.	38.98	29.341
Mackinaw City	45°47′	84°39′	587.02	605.	39.88	29.343
Alpena	45°5′	83°30′	589.	609.	40 62	29.345
Traverse City	44°45′	85°40′	598.	g 602.	43.83	29.332
Harrisville	44°39′	83°18′	h 616.	....	....	29.331
Port Austin	44°	82°	b 472.	....	....	....
Grand Haven	43°5′	86°18′	595.3	620.	45.72	29.334
Port Huron	43°0′	82°26′	602.	639.	45.23	29.333
Ionia	† 42°59′	† 85°4′	....	786.6	....	....
Swartz Creek	42°57′	83°49′	800.	....	....	....
Thornville	* 42°55′	* 83°10′	‖ 975.	‖ 980.	47.55	28.947
Agricultural College	42°44′	84°29′	820.	834.	46.60	29.092
Lansing, S. B. of H.	‡ 42°44′	‡ 84°33′	¶ 900.	¶ 917.	46.69	29.077
Birmingham	42°30′	83°10′	§ 752.	....	46.49	29.090
Detroit	42°20′	83°3′	585.	662.	48.41	29.322
Battle Creek	* 42°20′	* 85°11′	§ 800.	....	....	....
Ann Arbor	42°17′	83°44′	930.	936.	47.28	29.032
Marshall	42°17′	84°58′	c 885.	d 888.	49.92	29.036
Kalamazoo	42°13′	85°35′	i 975.	j 987.	48.02	29.019
Hudson	41°53′	84°21′	970.	....	....	....

* Estimated from lines on a map of Michigan issued by the General Land Office, Department of the Interior, 1878. For stations having no reference mark, the latitude and longitude were stated by the observer on the meteorological reports received.

† The exact latitude and longitude of the astronomical post at Ionia is 42°58′ 52.53″ N. and 85°3′ 49.20″ W.

‡ The exact latitude and longitude of the astronomical post placed in the ground near the new Capitol at Lansing, by the U. S. Lake Survey in 1875, as determined by the observations then made, is 42°43′ 53.11″ N. and 84°33′ 19.68″ W.

§ Estimated from data on "Railroad Profiles," pages 179–187, Annual Report of the State Board of Health for 1878.

‖ Estimated from data in Tackabury's Atlas of the State of Michigan.

¶ Estimated from comparisons of barometrical observations at Lansing, Port Huron, and Grand Haven, for the four years, 1879–82.

a 692 in May; 850 in August and September. b 478 June to December inclusive. c 880, d 883, July to December inclusive. e 627, f 631, July to December inclusive. g 605 in August and September. h for November and December, only. i 944, j 955, in November and December. k 581 in December.

NOTE.—Green's standard barometer was used at the above stations for the year 1887, Kalamazoo excepted. The barometer at Kalamazoo was manufactured by J. Foster, Cincinnati, Ohio.

METEOROLOGICAL CHARACTERISTICS OF THE YEAR 1887.

Among the most remarkable characteristics of the meteorological conditions of 1887 was the drouth which prevailed during the months of August and September, and which, by its baneful influence in drying up pastures and stunting the growth of those crops which needed moisture at that season, proved so injurious to the agricultural interests of the State. Observers report from various parts of the State, that, as a result of this drouth, corn, potatoes, and some other crops fell short of an average yield, and that farmers were obliged to resort to dry feed for their "stock" at a much earlier period than is usual.

The effect of the drouth on the depth of water in wells and upon the sickness from typhoid fever will be noticed further on in this article and in the article on "Causes of Diseases—Weekly Reports."

Although the annual average amount of precipitation (at 17 stations in Michigan) during the year 1887, was only 2.34 inches less than (at 18 stations) in 1886, and 7.36 inches less than the average (of groups of stations in Michigan) for the ten years 1877-86, this shortage in the precipitation nearly all occurred during the months of August and September, the aggregate rainfall in those two months being 4.59 inches less in 1887 than in the corresponding months of 1886, and 2.17 inches less than the average for those months, in the ten years 1877–86.

This drouth was not confined to Michigan. Reports received at this office from meteorological exchanges and correspondents in other States testify to its having existed in those States, followed by injurious results similar to those noted in this State.

METEOROLOGICAL CHARACTERISTICS OF THE YEAR 1887, AT ONE CENTRAL STATION.

At the State Agricultural College, near Lansing, and near the center of the thickly settled part of the State, the average temperature for 1887 was 0.40° higher than for 1886, and 0.15° higher than the average for the preceding 23 years; the annual range of temperature was 13° greater than in 1886 and 11° greater than the average annual range for the preceding 14 years; the average monthly range of temperature was the same in 1887 as that for 1886, and 1° greater than the average for the preceding 13 years; the average daily range of temperature was 1.21° greater than in 1886, and 0.82° greater than the average for the preceding 13 years; the average cloudiness was 2 per cent less than in 1886, and 3 per cent less than the average for the preceding 23 years; the rainfall (rain and melted snow) was 3.15 inches more than in 1886, and 1.17 inches less than the average for the preceding 23 years; the average atmospheric pressure was .003 of an inch greater than in 1886, and .031 of an inch greater than the average for the preceding 12 years. In Exhibit 3, pages 6 and 7, is given by year and months, a comparison of conditions in 1887, at the Agricultural College, with those in 1886, and with averages for periods of years. May, July, December, June, February and November (naming months in order of greatest difference) were months in which the average temperature in 1887 was higher than average for corresponding months in the preceding 23 years; October, January, March, September, August and April were months in which the average temperature in 1887 was lower than the average for corresponding months in the preceding 23 years, at that station, which is near the central part of the State.

Whoever will carefully study Diagram No. 1 (p. 18) in this article and in similar articles for preceding years, will see that thermometers and methods of observation have become so perfect that, given a curve representing correctly the temperature by months at one station in Michigan, curves can readily be constructed without actual records which will somewhat closely represent the temperature at each of several other stations, because the curves for many stations run so nearly parallel that all that is necessary to do is to find the average difference of mean annual temperature at the station to be represented compared with the station for which the data are given. It may also be seen that a curve representing the temperature at a station in the central part of the State very closely resembles the curve representing the average for many stations representing nearly all parts of the State. This proves that the practice adopted many years ago of stating the meteorological characteristics at one central station is a reasonably safe practice, and it is especially useful when it enables us to gain a comparison for a longer period than can be made from records at many stations, and also when employed in advance of the receipt of records from all stations, as is the case when the weekly bulletins of "Health in Michigan" are issued, for the purposes for which the meteorological conditions at the State Capitol are used to represent the conditions probably prevailing throughout the State.

EXHIBIT 3. - *Statements of Meteorological Conditions in the Year and in each Month of the Year 1887, Compared with Annual and Monthly Averages for 1886, and for several Stated Periods of Years,—from observations by Prof. R. C. Kedzie, at the State Agricultural College near Lansing, Michigan.*

Meteorological Conditions.	1887 Compared with Averages for Previous Years.		In 1887	Meteorological Conditions.	1887 Compared with Averages for Previous Years.		In 1887.
	No. of Years Averaged, end'g with 1886.	More (+), or less (-), in 1887 than the Average for Previous Years.	More (+), or Less (-), than in 1886.		No. of Years Averaged, end'g with 1886.	More (+), or Less (-), in 1887 than the Average for Previous Years.	More (+), or Less (-), than in 1886.
YEAR 1887.				YEAR 1887.			
Av. Temp	23	+0.15	+0.40	*Continued.*			
Range of Temp*	14	+11°	+13°	Cloudiness	23	-3 per ct.	-2 per ct.
Av. Monthly Range of Temp*	14	+1°	=	Rainfall	23	-1.17 in.	+3.15 in.
Av. Daily Range of Temp *	13	+0 82	+1.21	Atmospheric Pressure	12	+.031 in.	+.003 in.
JANUARY.				FEBRUARY.			
Av. Temp	23	-3.46	-0.58	Av. Temp	23	+0.51	+1.99
Range of Temp*	14	+13°	+10°	Range of Temp*	14	-9°	-18°
Av. Daily Range of Temp*	13	+4.07	+7.25	Av. Daily Range of Temp*	13	-1.87	+0.65
Cloudiness	23	-2 per ct.	-6 per ct.	Cloudiness	23	+14 per ct.	+13 per ct.
Rainfall	23	+1.46 in.	-0.59 in.	Rainfall	23	+3.76 in.	+4.36 in.
Atmospheric Pressure	12	-.096 in.	-.074 in.	Atmospheric Pressure	12	+.099 in.	+.070 in.
MARCH.				APRIL.			
Av. Temp	23	-2.78	-3.04	Av. Temp	23	-0.35	-4.81
Range of Temp*	14	-6°	-6°	Range of Temp*	14	=	-2°
Av. Daily Range of Temp*	13	+1.27	+4.55	Av. Daily Range of Temp*	13	+1.06	+2.66
Cloudiness	23	-8 per ct.	-6 per ct.	Cloudiness	23	+2 per ct.	+1 per ct.
Rainfall	23	-0.81 in.	-1 85 in.	Rainfall	23	-1.57 in.	-1.09 in.
Atmospheric Pressure	12	+.095 in.	+.105 in.	Atmospheric Pressure	12	+.014 in.	-.0⅞
MAY.				JUNE.			
Av. Temp	23	+6.19	+6.23	Av. Temp	23	+0.88	+2.81
Range of Temp*	14	-7°	+1°	Range of Temp*	14	-3°	-1°
Av. Daily Range of Temp*	13	+1.55	+2.81	Av. Daily Range of Temp*	13	-1.34	-0.90
Cloudiness	23	-15 per ct.	-10 per ct.	Cloudiness	23	-3 per ct.	0 per ct.
Rainfall	23	-.069 in.	-0.25 in.	Rainfall	23	-1.79 in.	+0.55 in.
Atmospheric Pressure	12	+.047 in.	+.060 in.	Atmospheric Pressure	12	+.060 in.	+.039 in.

---

* By registering thermometers, set at 7 A. M., and recorded at 7 A. M., for the preceding calendar day.

Comments on Exhibit 3 are printed on page 4.

The low temperature for January, March, April, September and October, and the small amount of rainfall for June, July and August are especially noticeable.

EXHIBIT 8.—CONTINUED.—*Meteorological Conditions at the Agricultural College, in Months for the Year 1887, Compared with Averages for Corresponding Months in Preceding Years.*

Meteorological Conditions.	1887 Compared with Averages for Previous Years.		In 1887 More (+), or Less (-), than in 1886.	Meteorological Conditions.	1887 Compared with Averages for Previous Years.		In 1887 More (+), or Less (-), than in 1886.
	No. of Years Averaged, end'g with 1886.	More (+), or Less (-), in 1887 than the Average for Previous Years.			No. of Years Averaged, end'g with 1886.	More (+), or Less (-), in 1887 than the Average for Previous Years.	
JULY.				AUGUST.			
Av. Temp.	23	+4.04	+4.83	Av. Temp.	23	-0.84	-1.34
Range of Temp*	14	+7°	+6°	Range of Temp*	14	+8°	+7°
Av. Daily Range of Temp*	13	+1.13	-1.13	Av. Daily Range of Temp*	13	+0.92	+2.39
Cloudiness	23	-10 per ct.	-12 per ct.	Cloudiness	23	+1 per ct.	+4 per ct.
Rainfall	23	-1.96 in.	+0.85 in.	Rainfall	23	-2 in.	-3.80 in.
Atmospheric Pressure	12	+.041 in.	+.040 in.	Atmospheric Pressure	12	+.036 in.	+.055 in.
SEPTEMBER.				OCTOBER.			
Av. Temp.	23	-1.55	-3.21	Av. Temp.	23	-3.50	-7.40
Range of Temp*	14	+6°	+10°	Range of Temp*	14	+4°	+11°
Av. Daily Range of Temp*	13	-0.05	+2.70	Av. Daily Range of Temp*	13	-0.45	-2.44
Cloudiness	23	-1 per ct.	-7 per ct.	Cloudiness	23	+2 per ct.	+11 per ct.
Rainfall	23	+1.69 in.	-0.68 in.	Rainfall	23	-0.76 in.	+0.91 in.
Atmospheric Pressure	12	+.080 in.	+.052 in.	Atmospheric Pressure	12	+.001 in.	-.163 in.
NOVEMBER.				DECEMBER.			
Av. Temp.	23	+0.37	+1.72	Av. Temp.	23	+1.99	+7.56
Range of Temp*	14	-3°	-15°	Range of Temp*	14	+2°	-4°
Av. Daily Range of Temp*	13	+1.09	-0.60	Av. Daily Range of Temp*	13	+2.45	-2.33
Cloudiness	23	-12 per ct.	-9 per ct.	Cloudiness	23	-2 per ct.	+5 per ct.
Rainfall	23	+0.06 in.	+0.80 in.	Rainfall	23	+1.42 in.	+1.76 in.
Atmospheric Pressure	12	+.006 in.	+0.22 in.	Atmospheric Pressure	12	-.004 in.	-.090 in.

* By registering thermometers, set at 7 A. M., and recorded at 7 A. M., for the preceding calendar day.

LOCAL METEOROLOGICAL PHENOMENA IN THE SEVERAL MONTHS OF THE YEAR 1887.

The following general remarks relative to temperature, frosts, effects on vegetation, migration of birds, etc., in 1887, are taken from the monthly reports by observers. The names of observers are stated in Exhibit 1, page 2.

JANUARY.

A month of steady cold weather.—*Ripley*.

Light frosts, Jan. 2, 14, 16, 18, 24, 30, 31. Killing frosts, Jan. 3, 7, 8, 9, 12, 15.—*Marquette*.

Snow at close of the month, 19 inches. Ice on Gulliver Lake 16 inches at close of month.—*Gulliver Lake*.

Killing frosts Jan. 1, 3, 6, 8, 9, 10, 12, 13, 21, 27.—*Escanaba*.

Grand Traverse Bay froze over on Jan. 31.—*Traverse City*.

Frosts, Jan. 7, 8, 9, 15, 16, 25, 31. Melting snow on ground, Jan. 20, 22, 23, 28, 29, 30.—*Alpena*.

Heavy frosts, Jan. 26, 29.—*Grand Haven*.

Ground nearly bare of snow. Jan. 1-9, and 22-31 inclusive. Jan. 22, it did not freeze. The mercury fell below zero on seven days, and the mean temperature was below zero two days during the month.

January was a cold month, the mean temperature being about 4° below the long mean. Barometrical pressure very low. The snows commencing on the ninth fell very deep, but did not make good sleighing, being drifted badly on east and west roads, and too deep for work in the woods. The January thaw struck it on the 22d, but did not make much of a freshet, the water being largely absorbed by the dry, unfrozen earth. Ice on the ponds is thick—perhaps 16 inches—in the ground is not deep. The depth of water in the wells is a little more at the close of the month than it was at the middle, showing that some has got down.—*Thornville*.

Frosts, January 2, 7, 8, 9, 29, 31.—*Lansing*.

Frosts, January 2, 3, 4, 7, 8, 10, 11, 17, 25, 26, 29. Depth of snow on ground at end of month, in open fields, about three inches, in forests about six inches. Melting snow on ground, Jan. 20, 22, 23, 28, 29. —*Swartz Creek*.

January 18, snow about two feet deep. Jan. 20, warm, south wind, snow melting. January 23. still thawing.—*Ann Arbor*.

FEBRUARY.

Heavy frosts, Feb. 4, 9, 12, 13, 14, 15, 20, 21, 22, 25.—*Escanaba*.

Heavy frosts, Feb. 13, 20, 21, 23, 28.—*Mackinaw City*.

Light frosts, Feb. 1, 9, 12, 13, 14, 15, 20, 21, 22, 25. Heavy frost, Feb. 23. Melting snow on ground, Feb. 7, 8, 9, 10, 13, 15, 22, 26. Ground frozen about one foot and ten inches.—*Alpena*.

Heavy frost, Feb. 9.—*Grand Haven*.

Feb. 7, trees loaded, and ground covered with ice. Feb. 8, ice melting with rain. Feb. 11, ground covered with ice again which melted Feb. 14. Feb. 25, ice storm during night.

Feb. was a rough, stormy month with fair average temperature, and notable for its waves of high barometrical pressure, two of which were accompanied with storms—one being the highest ever observed by me. There is no snow on the ground at the close of the month except snow banks, but plenty of ice on the northern declivities. On the ponds it is about 14 inches thick, but shallow in the ground. Wheat is probably injured to some extent by the freezing of the bare ground.—*Thornville*.

Frosts, Feb. 9, 12, 27, 23, 25.—*Port Huron*.

Frosts, Feb. 8, 9, 11, 13, 14, 16, 17, 23, 27. Melting snow on ground, Feb. 6, 7, 8, 9, 10, 14, 15, 18, 26.—*Swartz Creek*.

Feb. 8.—It has been raining, though not heavily, for the last three days.—*Ann Arbor*.

Frosts, Feb. 2, 17, 23. River closed, Feb. 28. Robin heard this morning, Feb. 18.—*Lansing*.

MARCH.

Frosts, Mar. 1, 4, 8, 10, 14, 19, 20, 22, 23, 25, 26, 27, 28, 29.—*Marquette*.

Heavy frosts, Mar. 1, 3, 4, 8, 10, 11, 12, 14, 19, 20, 21, 22, 23, 25, 29, 30, 31.—*Escanaba*.

Killing frosts, Mar. 10, 11.—*Mackinaw City*.

Light frosts, Mar. 2, 3, 8, 10, 23, 25, 26, 30, 31. Heavy frosts, Mar. 11, 20, 21. Melting snow on ground, Mar. 1, 2, 7, 9, 12, 13, 19, 20, 21, 23, 24, 30. Ground frozen about 1 foot and 6 inches.—*Alpena*.

Spring birds, Mar. 7.—*Parkville*.

Frosts, Mar. 1, 7, 8, 20, 21, 23, 26, 30, 31.—*Grand Haven*.

Light frosts, Mar. 4, 9, 20, 21, 26. Killing frosts, Mar. 16, 30. St. Clair River is open from this point to Algonac.—*Port Huron*.

First robin seen, Mar. 8. First blue-bird, Mar. 11. First meadow-lark and song sparrow, Mar. 20. First chewink, Mar. 21. First red winged blackbird, Mar. 26. Wild geese were heard going north, Mar. 26. Large black butterfly with white edged wings seen, Mar. 20. Honey bees flying, Mar. 20.

March has been a cold, dry month with an average temperature of about 5° below the normal, with no night that did not freeze, and bare ground till Mar. 22. It has been severe on the wheat and clover. On the whole the month has been very wintry and, as it closes, the ice is not disturbed on the ponds and the ground has been quite well covered with snow since March 22. The frost in the ground is not very deep. Snow and ice melted some on last day of month.—*Thornville.*

Crows seen, Mar. 1. Chicken hawk seen, Mar. 7. Blackbirds, robins, meadow-larks, bluebirds and killdeer seen, Mar. 9. Melting snow, Mar. 1, 2, 6, 7, 20, 31. Frosts, Mar. 2, 3, 11, 18, 20, 22, 26, 28, 29. Wheat looking well, About one inch of snow on ground.—*Swartz Creek.*

Frosts, Mar. 9, 10, 17, 19, 20, 23, 26, 30, 31. River opened Mar. 5. Meadow-larks, chewinks, ground, wood and song sparrows arrived, Mar. 21. Blackbirds and bluebirds first seen Mar. 7.—*Lansing.*

Mar, 1, bluebirds in trees. Mar. 7, blackbirds arrived. Mar. 8, robins on the lawn.—*Kalamazoo.*

APRIL.

Light frosts, April 6, 16, 17, 20, 27, 29. Heavy frosts, April 7, 21.—*Marquette.*

Frosts, April 1, 6, 7, 8, 17, 21, 26.—*Escanaba.*

Wild geese fly north, April 15. Ice goes out of Grand Traverse Bay, April 22. Martins arrive, April 24. Frost, April 25.—*Traverse City.*

Killing frosts, April 17, 18, 19, 21, 27, 30.—*Mackinaw City.*

Frosts, April 6, 7, 9, 17, 18, 19, 21, 22, 25. Heavy frost, April 8. Melting snow on ground April 2, 4, 5, 25. Frost disappeared from ground about April 29. River clear of ice, April 14. Navigation opened, April 18. First boat of the season "Steamer Atlantic" from Detroit, Mich., arrived at this port at 9:30 p. m., April 18. She was six days forcing a passage through 8 miles of ice in Thunder Bay.—*Alpena.*

Frogs first heard April 8. Mosquitoes around April 8. Grass began to grow April 9. Plowing began April 12. Willow, elm and hazlenut in blossom, April 23. Lilac and Missouri currant buds opening April 28. Black-headed fly catcher returned, April 4. Killdeer plover returned, April 5. Kingfisher returned, April 6. Hawk seen with snake in his claws, April 30.

April was a dry month with much sunshiny weather, the mean temperature being about normal. Although the precipitation was so small (1.46 inches) the soil did not dry up badly, and the wheat grew as well as in any April that is remembered. Other vegetation seems rather backward, but wheat never looked better at this season, very few fields showing much winter killing.—*Thornville.*

Frogs first seen, April 3. Ice formed, April 11, 16, 17, 23, 24, 25. Plowing began April 12. Oats sown April 20. Frosts, April 1, 5, 7, 11, 16, 18, 23, 24, 29.—*Swartz Creek.*

Temperature low all this month.—*Parkville.*

April 10, grass and buds starting nicely.—*Ann Arbor.*

Frosts, April, 6, 17, 18. Butterfly seen, April 7. Erythronium Americanum, Hepatica triloba, Claytonica Virginica, Thalictrum anemonoides, Sanguinaria Canadensis, in full bloom, April 17. Dentaria diphylla, Dicentra Canadensis, Dicentra cucularia nearly in bloom, April 17. English elm in blosom, April 29.—*Lansing.*

First appearance of martins, April 1. First appearance of Baltimore orioles, April 30. Ice formed quarter of an inch thick, April 17 and 19.—*Hudson.*

Wild geese flying west, April 3.—*Kalamazoo.*

MAY.

Navigation opened, May 5.—*Ripley.*

Orioles seen, May 1; dandelions out, May 2; pear and cherry trees in bloom, May 6; Missouri currant in bloom, May 7; early apple trees blossomed, May 8; Lilacs in blossom, May 11.—*Lansing.*

Heavy frost, May 4. Light frost, May 6.—*Escanaba.*

Killing frost, May 4.—*Mackinaw City.*

Frost, May 29.—*Port Huron.*

Frost, May 4.—*Parkville.*

Progress of Vegetation.—Soft maple in blossom, May 2. Apple, tamarack and willow leafing, May 3. Sugar maple and June berry in blossom, May 8. Elm leafing, May 9. Peach, plum and cherry blossoming, May 10. Dandelions and apples blossoming, May 12. Red and yellow oak leafing, May 13. Poplar, locust, white oak and basswood leafing, May 14. White thorn blossoming, May 16. Migratory birds returned as follows:—Barn swallows, May 1; bobolinks, May 2; oriole, kingbird, and catbird, May 4; brown thrush, May 5; cuckoo, May, 20; orchard oriole, May 24.

May was a dry, hot month till the 23d, no appreciable rain having fallen between the second and the above date. The mean temperature of the whole month is 5° or 6° higher than the normal. The drought did considerable hurt to the crops, and the washout on the 23d was quite bad for them, especially for newly planted corn. The precipitation was partly hail, with a gale of wind and heavy thunder and lightning; 1.76 inches fell in less than an hour.—*Thornville.*

Cherry trees in blossom, May 5. Plum trees in blossom, May 8. Apple trees in blossom, May 12. Wheat in head on summer fallow, May 22.—*Swartz Creek.*

May 8, peaches, strawberries and cherries beginning to bloom. Trees on timbered lands quite advanced in leafing. Considerable corn being planted.—*Birmingham.*

JUNE.

Progress of vegetation:—June 1, wheat heading; June 6, strawberries ripe; June 19, haying begun; June 20, oats heading; June 29, raspberries ripening.

June was a hot month but with an average temperature not much above normal owing to the coolness of the nights. The main character of the month was drought, but there was some disagreeable, hot weather that rusted the wheat where it was lodged down by the gale and storm of June 17, and generally where the growth was unusually heavy. The dry weather hurt June clover which is turning out poorly when cut. Oats will not fill well unless rain comes soon. Corn being generally well worked out is growing finely; but early potatoes will be a failure without some wetting down of the hills without much delay.—*Thornville.*

Haying began, June 14. Crop good and being secured in fine condition. At the close of the month it is dry and potatoes, oats, corn and small fruits need rain. Wheat is looking well. I am informed that some wheat has been cut in Shiawassee Co. about 10 miles S. E. of this station. None is ready for harvest here but will be, in from 5 to 10 days. Wheat harvest began, June 30. Oats in head, June 22.—*Swartz Creek.*

JULY.

Light frost, July 23.—*Mackinaw City.*

Katydids began to sing, July 20.

A month of smothering heat and dust. Wheat cutting hung on for want of help, being hardly finished, July 25, some being drawn after that date. Oats harvest began immediately after the wheat was secured. There are no good crops except wheat and hay, everything else being more or less injured by the heat and drought. The month will be remembered a long time as the *hot harvest.*

Unless rain comes soon corn and potatoes will be a complete failure. Gardens are that now. A larger extent (perhaps double) of peas was sowed about here than ever before. They are a failure. Young seeding of clover is hurt badly and plowing for wheat is backward.—*Thornville.*

Frost, July 23. The month has been very hot, and the last part very dry. Our mean temperature is 5.93° higher than the mean temperature for the past four years, 1883-1886. Rainfall is below the average, and nearly two-thirds of the fall was on the first four days of the month, there being none at all after the 22nd. Our potato crop will be light. Corn is being injured by the long continued drouth; oats are light in weight, and wheat is not as good in quality as we had supposed it would be at the beginning of harvest. Pasturage is very poor. Some farmers are using the clover meadows that they had intended for seed.—*Swartz Creek.*

The highest temperature and most severe drouth have prevailed here during this month that have ever been recorded. The damage to growing crops is beyond estimate. Many fields of corn and peas are absolutely dead. Farmers are cutting up their earless cornstalks and feeding them to their starving cattle. Notwithstanding all this drouth, from six to fifteen miles south of here lies a strip of country which has suffered from excessive local rains to the extent of destroying corn and potatoes. It may be added that much wild vegetation, including shrubs and small trees, are dying from the effect of the drouth.—*Birmingham.*

The hot, dry weather has parched everything and destroyed all summer crops.—*Parkville.*

AUGUST.

Light frosts, August 25, 28.—*Lansing.*

Slight frost, Aug. 28; no damage done by it. August was a continuation of the long drouth till the 10th, on which date heavy rain (1.44 inches) fell, effectually putting an end to it, coming down moderately and soaking into the dry ground. Much good was done to the plowing, young clover and pasturage, and some to late corn and potatoes as well as minor crops, such as beans and buckwheat. Wheat is not quite as good as was expected from the amount of straw, and oats are shrunken somewhat. Apples are a small crop of good quality and there are peaches where there are trees left.—*Thornville.*

Light frosts, Aug. 24, 25, 26.—*Hudson.*

Crops are suffering for want of rain, Aug. 1. Rainfall of .35 in., Aug. 5. Light rain most of the day, Aug. 22. We have not had sufficient rain to wet down to the roots of plants since June.—*Port Austin.*

Frosts, Aug. 25, 28, 29, 30. Corn cutting began, Aug. 24. Wheat sowing began, Aug. 30.—*Swartz Creek.*

SEPTEMBER.

Slight frost September 8, the first—10, 12, 15, 22. Killing frost Sept. 16, the first—24, 28, 29.—*Marquette.*

Frost September 10, first of the season, 16, 22, 23, 24.—*Gulliver Lake.*

First light frost of season Sept. 19. Light frost, 26. First killing frost Sept. 24.—*Mackinaw City.*

First killing frost of season occurred during night of September 15. Vegetation slightly damaged. Frost also occurred on 17, 24, 25, 26, and 28—*Alpena.*

Frost, light, Sept. 8, 10, 16, 17 and 23, Killing frost on 24.—*Grand Haven.*

Sept. 17, frost to partly kill the the vines. We have had but two frosts to do any harm.—*Port Austin.*

Frost Sept. 25.—*Port Huron.*

Frost Sept. 17, light, nothing killed; 24, heavy frost, everything tender killed; 26, heavy frost. No barn swallows were seen during the month, and all other birds were scarce. Some large flocks of young blackbirds left about the 20th. Old blackbirds left earlier. Some robins and bluebirds are still here.

September was cooler than the normal and a good month for wheat sowing. The rains of the fore part of the month put the soil in good, moist condition, and the dry latter part was favorable for work. The rain of the 30th, was needed to help the growth which had been rather slow. Corn husking, potato digging and apple picking are going on, with meager results in every case. Beans and buckwheat were killed by the frost. Wheat, grass and oats are all the crops that amount to much. There is still some new land to be sowed to wheat.—*Thornville.*

Ice formed Sept. 23 and 25. Frost, 15, 16, 23 and 25.—*Swartz Creek.*

Sept. 24. Frost this morning.—*Ann Arbor.*

Frost occurred on the morning of Sept. 7, 15, 16, 17 and 24. Ice formed morning of 24th, ¼ inch in favorable places, killing vines and other tender green plants.—*Hudson.*

Morning of Sept. 8, had hoar frost in the valleys which are 150 to 175 feet lower down than the Asylum grounds. At the Asylum it was dew.—*Kalamazoo.*

Frost, Sept. 16, 17, 23. Ice formed, 23d.—*Lansing.*

Light frost, Sept. 8, 16 and 17; ice formed on 24th.—*Parkville.*

Sep. 24, heavy frost, first of the season. Frost on 26th.—*Birmingham.*

OCTOBER.

Frost, light, Oct. 18, 27, 31. Killing, 25th.—*Marquette.*

Frost, Oct. 18. Ground frozen, 25, 26, 27, 28; 12, 3 flocks geese north; 13, flock geese north at 7:00 P. M; 22, large flock geese south at 2:00 P. M; 25, thin ice nearly across Gulliver Lake; 31, snow on ground in spots. Ice across Gulliver Lake ⅛ inch thick.—*Gulliver Lake.*

Cold wave on Oct. 25. First ice formation on A. M. 12. Frost on 10, 14, 15, 17.—*Escanaba.*

Frost formed on Oct. 12, 14, 15, 19, 22, 23, 24, 25, 26, 30 and 31. Melting snow on the ground, 11, 21, 24, 25, 29.—*Alpena.*

Oct. 6, frost in spots.—*Port Austin.*

Flurries of snow, Oct. 11, 14, 24. Frost, 11, light; 15, heavy—froze every night after 17th. Falling of leaves of deciduous trees. Butternut nearly bare, 1; maple and black ash, 10; wild cherry, bassswood and elm, 15; all others except oak and tamarack, 29. Movements of migratory birds.—Flocks of bluebirds and robins were frequently seen till the 25th, a pair of the latter on the 27th. No others were seen except a solitary chewink on the 6th, and a flock of wild geese, 23d, and 3 more on the last day of the month. Crops—their condition, etc.—Corn more than half cribbed, cornstalks mostly cut; potatoes generally dug, some loss on them by freezing. Apples all saved except for cider. Wheat not looking well; on account of the cold, dry weather it must go into winter quarters with a very small top. The first ten days of Oct. were warm and moist, the last ten were winter weather. The rain-fall of the month was too small for the good of the wheat. Water is very low, swamps and cat-holes are dry enough to plow. Stoned-up wells are generally failing. There is some typhoid fever, but the type does not seem to be malignant.—*Thornville.*

Oct. 4, first snow of season. 14, heavy frost; quarter of inch of ice formed. Frost, 18, 19, 21, 23, 26.

Ice formed, 23. Slight snow fall, 21, 29. 26, several flocks of geese were observed flying south-southwest during the evening.—*Lansing.*

Earthquake.

October 6, two slight earthquake shocks felt in rapid succession at 7:30 A. M.—*Ann Arbor.*

Frost, Oct. 15, 19 and 20.—*Ann Arbor.*

First snow Oct. 11 (trace). Light snow, 21, 29. Hail, 21. Ice formed ¼ inch, 28 and 29.—*Hudson.*

Oct. 21, light snow flurries during day; 24, large flocks of wild geese flying south; 26, heavy frost.—*Birmingham.*

Snow fell Oct. 21, 22, 24, 29; wild geese on 13th.—*Parkville.*

NOVEMBER.

Light frost, Nov. 1, 8, 11, 29.—*Marquette.*

White frost, Nov. 8, 11, 12; robins on 15th; 21, Gulliver Lake frozen over solid; 23, close of navigation at Manistique; 29, R.R. bank frozen one foot deep; 30, snow three feet deep. I walked across Gulliver Lake on the ice.—*Gulliver Lake.*

Cold wave on Nov. 27 and 28. Gale very severe on Nov. 19; max. velocity of wind 36 miles from north, accompanied by blinding snowstorm.—*Escanaba.*

Light frost formed Nov. 1, 12, 13, killing frost, 16, 29; depth of ground frozen, about 4 inches; melting snow on the ground, 9, 26; bay and river partly frozen over.—*Alpena.*

Light frost Nov, 5, 11, 14; killing frost, 1, 3, 8, 9, 12, 13.—*Grand Haven.*

We have had not to exceed 3 inches of snow, and but little rain, of which we are in want. The fall has so far been fair.—*Port Austin.*

Froze every night of Nov. except 7, 14, 15, 16, 26, 27; heavy snow 24. Nov. was excessively dry till rains of the latter part of the month relieved matters some. Water on the top of the ground was nearly dried up. Some of the large drains (county drains) run yet, and are perfect godsends to people living near them. I have seen cattle driven a mile to water them at one. More wells—four times over, have been dug about here than ever in one month before, if I had said ten, perhaps it would not be an exaggeration; well digging is a flourishing business just now. Some few wells are dug and stoned, and there are some bored and crocked, but the greater number are driven. The last is the kind to be preferred where a good one can be had; where the point stops in gravel it is all right, if in quick-sand, it is not apt to be successful. The average temperature of the month was not below the normal.—*Thornville.*

Nov. 19, first snow storm of the season, light; during this day and a part of the 20th it snowed perhaps half an inch.—*Ann Arbor.*

Frost Nov. 1, 5, 6, 8, 12, 13, 17, 18, 29, 30. 20th, Grand River frozen over, opened on 24th, and closed again night of 28th. Ground bare at end of month.—*Lansing.*

Winter set in Nov. 19.—*Parkville.*

DECEMBER.

Light frost, Dec. 12, 15. Killing, 6.—*Marquette.*

Dec. 24, last fish tug laid up at Manistique. Snow at end of month 22 inches; frost 4 inches deep in ground. Month remarkable for having minimum temperature above zero.—*GulliverLake.*

Frost occurred Dec. 11, 13, 14, 16 and 30, (killing.) Snow storms 28 and 31. Navigation closed, 15. Little Bay de Noc frozen over, ice 6 to 7 inches in thickness.—*Escanaba.*

Frost occurred Dec. 6, 9, 10, 15, 16, 17, 19, 20, 30. Melting snow on the ground 7, 14, 15. Ground frozen about 20 inches; navigation closed on the 23d; bay and river frozen over; last boat of the season, "Tug Saugatuck," arrived here on the morning of the 11th, and left for Bay City the same day.—*Alpena.*

Dec. 18, lights were stopped in the lighthouse; steamers were seen passing. A very little ice on the lake; snow on the ground about 4 inches, 31. The month has been fine, and farmers continued plowing up to the 18th.—*Port Austin.*

Nights that did not freeze, Dec. 9 and 10. Inappreciable snow, 18, 19, 25, 28.

A cloudy month of moderately cold weather for the season, there being none really severe, and notable for its limited range of daily temperature. The frost in the ground in the open is 5 inches, in the woods almost nothing. There was no sleighing till the last two days of the month, and then not good, although enough snow fell, it being drifted by the wind till east and west roads were almost bare.—*Thornville.*

Dec. 4, river opened. Frost occurred on 8, 13, 20 and 29; river closed 21,.—*Lansing.*

Heavy frost Dec. 14. 15, 28 and 29; hail on 31st.—*Hudson.*

Bees were out Dec. 4 and 14.—*Parkville.*

Light frost Dec. 6. Killing frost 9.—*Grand Haven.*

MEASUREMENTS AND TEMPERATURE OF GROUND WATER.

In a paper entitled "Typhoid Fever and Low Water in Wells," on pages 89-114 of the Report of this board for 1884, it is shown that for the years 1878-82 there was a relation between the sickness and deaths from typhoid fever in Michigan and the depth of water in wells. In the month of October, when the water in wells reached the lowest point in the year, there were the most deaths and sickness from typhoid fever; and following the month of April, when the water in wells was highest, there were the least deaths and sickness from typhoid fever. When this comparison is made in a diagram, it is found that, "beginning with June in each year the curve representing sickness from typhoid fever follows more or less closely the curve representing the average depth of earth above the ground water."

Typhoid fever being one of the most important causes of deaths in Michigan, it is of very great importance that further evidence be collected on this important subject.

The measurements for each month in 1887, of the depth of wells at eight places in Michigan, are shown in Exhibit 4; also the depth of earth above water in wells and temperature of water in wells. It is hoped these measurements and observations may continue, and permit a more extended comparison of the depth of water in wells with the sickness from typhoid fever, and with sickness and death from other diseases.

CHANGE OF EXPOSURE OF INSTRUMENTS AT LANSING IN 1884.

Comments on the subject of a new instrument shelter at Lansing are printed on page 21, Report for 1885. Exhibits A, B, C, and D, pages 22 and 23, of the report of 1886, relate to that subject, and may be studied in connection with what is said on page 21, Report for 1885. The fact of the change of place of observation in 1884 may need to be taken into account by whoever studies the meteorology at Lansing through a long series of years.

EXHIBIT 4.—*Depth of Wells; Depth of Ground above Water in Well; Temperature of Water in Well, and Day of observation of such temperature, in each month of the Year 1887, as reported by Meteorological Observers for the State Board of Health, and for the United States Signal Service.*

Stations in Michigan.	January.			February.			March.			April.			May.			June.		
	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.
Alpena	8	6 1	34^{16}	8	6 3	34^{18}	8	7	34^{17}	8	7 2	35^{18}	8	7	43^{11}	8	7 1	64^{16}
Thornville	20	18 6	36^{16}	20	17 5	42^{15}	20	17 2	41^{18}	20	17 2	45^{16}	20	17 8	47	20	17 4	49^{15}
Kalamazoo	25	10	48^{15}	25	10	48^{15}	25	10	48^{15}	25	10	48^{15}	25	10	48^{15}	25	10	52^{15}
Otsego	17	14 11	------^{15}	17	11 6	------^{15}	14 6	8 6	------^{15}	14 6	8 6	------^{16}	14 6	9 6	------^{16}	14 6	10 6	------^{16}
River Raisin *	23	17 6	44^{17}	23	14 6	44^{15}	23	14 6	43^{15}	23	14 6	43^{18}	23	15 6	46^{13}	23	15 6	46^{17}
Hillsdale	30	26 7	49^{15}	30	18 2	48^{15}	30	18 10	49^{15}	30	20 5	49^{15}	30	21	------^{15}	30	22	50^{15}
Lansing, S. B. of Health	26 11½	24 8¼	50^{17}	26 11½	23 11¾	41^{14}	26 11½	23 4¾	42^{16}	26 11½	23 6	46^{15}	26 11½	23 9½	47^{16}	26 11½	23 11¾	48^{15}
Battle Creek	--------	--------	------	--------	--------	------	--------	--------	------	--------	--------	------	--------	--------	------	50	46	56^{20}
Ann Arbor	15	9 3	42.5^{16}	15	7 11½	36^{15}	15	10 5¼	39^{17}	15	11 4	41^{17}	15	12	44^{15}	15	13 10¾	48^{29}

NOTE.—The small figures above and at the right of the numbers denoting the degrees of temperature, state the day of the month on which the observation was made.

FEB. 15.—"Have had a freshet, and the river booming; and ponds in low places on the plains."—*River Raisin.*

MARCH 15.—"High water, had a freshet."—*River Raisin.*

* D. W. Palmer, Observer.

EXHIBIT 4.—*Continued.*

Stations in Michigan.	July.			August.			September,			October.			November.			December.		
	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. or Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well—Deg. F.	Depth of Well.—Ft. In.	Depth of Ground above Water in Well.—Ft. In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.
Alpena	8	6 9	64^{20}	8	7 1	54^{18}	8	6 9	47^{19}	8	7 1	40^{17}	8	6 9	32^{18}	8	6 6	33^{17}
Thornville	20	18 2	50^{16}	20	18 1	52^{16}	20	18 5	52^{15}	20	18.5	49^{16}	20	18 5	48^{16}	20	18 4	40^{16}
Kalamazoo	25	10	50^{15}	25	10	51^{16}	25	10	52^{16}	25	10	52^{16}	25	10	50^{25}	25	10	48^{18}
Otsego	14 6	11 2	......^{15}	14 6	11 9	......^{15}	14 6	13	......^{16}	14 6	11 10	......^{15}	14 6	13	......^{15}	14 6	12	......^{15}
River Raisin*	23	16 6	50^{15}	23	17	52^{15}	23	17	52^{17}	23	17	50^{15}	23	18 6	50^{17}	23	17 6	46^{16}
Hillsdale	30	23 2	50^{15}	30	24 5	49^{17}	30	25 4	50^{15}	30	25 10	50^{15}	30	26 7	50^{15}	30	25	50^{15}
Traverse City†	55	37 4	46^{26}	55	37 2	46^{24}	55	37 10	46^{22}	55	38 2	47^{22}	55	38	47^{26}	55	37 6	48^{23}
Lansing, S. B. of H.	26 11½	24 2⅜	49^{16}	26 11½	24 2¾	51^{16}	26 11½	24 3¼	50^{15}	26 11½	24 5¾	51^{15}	26 11½	24 8¾	52^{15}	26 11½	24 5⅞	51^{16}
Battle Creek	52 6	49 4	56^{18}	52 4	47 6	56^{20}	52 4	49 10	55^{16}	52 4	48	54^{16}	52 4	48	54^{16}	52 4	47	54^{17}
Ann Arbor	15	13 9⅜	52.5^{25}	15	13 10¾	53^{22}	15	14 ⅜	54^{16}	15	14 1¼	54^{19}	15	14 4¼	50^{16}	15	13 ⅞	45^{15}

NOTE.—The small figures above and at the right of the numbers denoting the degrees of temperature, state the day of the month on which the observation was made.

AUG. 15.—"Have had but little rain since July 1—drouth severe."—*River Raisin.*

* D. W. Palmer, Observer.

† At Northern Michigan Asylum, W. H. Bauıd, Observer.

TEMPERATURE.

Compared with the average for the preceding 23 years at the Agricultural College, the mean temperature for January and October was low. A comparison, by months, of temperature in 1887, with the averages for corresponding months in the preceding 23 years, 1864–86, at the Agricultural College, near Lansing, is given in Exhibit 6, page 22.

The average temperature, by months, for the eight years, 1879-86, at Lansing, and a comparison of 1887, by months, with that average, are stated in Exhibit 7, page 22.

The average annual and monthly temperature at from 12 to 22 stations for a period of 10 years, 1877-86, is stated in exhibit 5, page 17, in which is also given, by months, a comparison of 1887 with the average for 1886, and with the averages for the 10 years, 1877-86. By exhibit 5, page 17, which gives averages for groups of several stations in Michigan, it appears that in 1887 the mean temperature in March, April, September and October was lower than in those months in 1886. It also appears that October was much colder than the average temperature of the corresponding month for the 10 years 1877-86, and May, June and July were warmer than the average temperature of the corresponding months for those years.

By Exhibit 10, page 26, it appears that, at the Agricultural College, the lowest temperature reached in January, 1877, was considerably below the average lowest temperature for the preceding 14 years, and that in the month of January, 1887, the range of temperature was much greater than the average range of temperature for the corresponding month in the 14 preceding years, and also the highest temperature for 1887 was above the average highest temperature for the preceding 14 years, and the lowest temperature was below the average lowest temperature for those years. The highest and lowest temperatures at the Agricultural College, in every month of the 15 years, 1873–87, and comparisons of months in 1887, with the average highest and lowest temperatures by months for the preceding 14 years, are stated in Exhibit 10, page 26.

The average temperatures at each of 17 stations in Michigan, and the average for the 17 stations in 1887, and in each month of that year, are stated in Table 1, page 19; 7 of the lines in this table are represented in Diagram I., page 18.

The average daily range of temperature at from 6 to 18 stations per year, by months, for a period of 8 years, 1879–86, and a comparison of 1887, with the monthly averages for that period and for 1886, are given in Exhibit 8, page 23. The highest and lowest temperatures in every month in 1887, at each of 17 stations, are stated in Table II., pages 20 and 21. The average daily range of temperature by months in 1887, at each of 17 stations, and the average for the 17 stations, are stated in Table III., page 25. The lines for 9 of these stations, and the average line for the 17 stations, are represented in Diagram II., page 24. It will be noticed that the greatest average daily range occurred during the months of April, May, June, July, August and September.

EXHIBIT 5.—*Average temperature by year and months, in 1887,* compared with annual and monthly averages for the ten years, 1877-1886. These averages are for groups of several stations in Michigan.*

Years, etc.	Average Temperature—Degrees Fahr.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 10 years, 1877-86	46.11	20.56	23.62	29.80	44.33	56.08	65.10	70.52	68.14	61.67	50.83	36.04	26.60
Av. 8 years, 1879-86.	45.39	19.91	21.77	28.82	43.04	55.98	64.79	69.78	66.25	61.11	50.68	35.56	25.82
1886 (17 stations)	44.82	18.72	21.18	30.10	46.04	54.69	63.31	68.68	67.36	61.15	51.84	34.32	20.44
1887 (17 stations)	44.82	16.58	21.57	25.55	42.09	60.68	66.53	73.22	66.41	57.95	44.46	35.18	27.57
In 1887 **Higher** than Av. for 10 years, 1877-86	......	......	......	......	......	4.60	1.43	2.70	......	......	......	......	0.97
In 1887 **Lower** than Av. for 10 years, 1877-86............	1.29	3.98	2.05	4.25	2.24	......	......	......	1.73	3.72	6.37	0.86	......
In 1887 **Higher** than in 1886	0	......	0.39	......	......	5.99	3.22	4.54	......	......	......	0.86	7.13
In 1887 **Lower** than in 1886............	......	2.14	......	4.55	3.95	......	......	......	0.95	3.20	7.38	......	......

NOTE.—The stations represented in the lines for average temperature for the years 1877-87 in Exhibit 5, are the following: Thornville, Kalamazoo, Detroit for 1877-87; Mendon for 1877-82; Tecumseh for 1877-85; Battle Creek for 1877-80, 1882, 1885; Nirvana for 1877-9, and first four months of 1880; Reed City for last eight months of 1880 and 1881-5; Coldwater, Ypsilanti, Woodmere Cemetery (near Detroit) for 1877-9; Otisville for 1878-80, 1882; Niles for 1878-9, 1881; Marquette for 1879-84, and 1886-7; Alpena, Grand Haven, Port Huron, Lansing for 1879-87; Washington for 1879-83; Benton Harbor for 1877-8; Agricultural College for 1877 and 1881-7; Petoskey for 1878-9; Escanaba for 1880-87; Harrisville for 1881-2 and 1885-6; Ann Arbor for 1881-7; Parkville for 1881-2; Traverse City, Marshall for 1882-7; Hillsdale for 1882-4; Winfield for 1881 and 1883; Hudson and Mallory Lake for 1881; Ionia for 1883-5; Manistique, Swartz Creek for 1884-5; Mackinaw City for 1884-7; Port Austin for 1885; Muskegon, Pentwater for 1886; Birmingham, Otsego, Gulliver Lake for 1887.

* Beginning with the year 1885, allowance must be made for Lansing in Exhibit 5, because of a change in location of the instruments. The amount of the variation by months is shown in Exhibit A, on page 22, Report for 1886.

Foot-notes to Table IV., from page 29.]

B At Marquette a whirling psychrometer was used in 1887.

a, b, c. In the columns from January to December, inclusive, the letters a, b, c, stand directly above the numbers from which they refer to the notes below.

a For 92 observations. b For 91 observations. c For 90 observations. d For 89 observations.
e For 88 observations. f For 86 observations. g For 84 observations. h For 83 observations.
i For 82 observations. j For 81 observations. k For 76 observations. l For 74 observations.
m For 73 observations.

¶¶ The computations of Absolute Humidity at Ann Arbor for each month in 1887, were furnished by the observer there. All other computations in Table IV. were made at the office of the Secretary of the State Board of Health.

Foot-notes to Table V., from page 31.]

§§ Beginning with the year 1885, allowance must be made for Lansing in Table V. because of a change in location of the instruments. The amount of the variation by months is shown in Exhibit D, page 23, Report for 1886. a, b, c. In the columns from January to December, inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

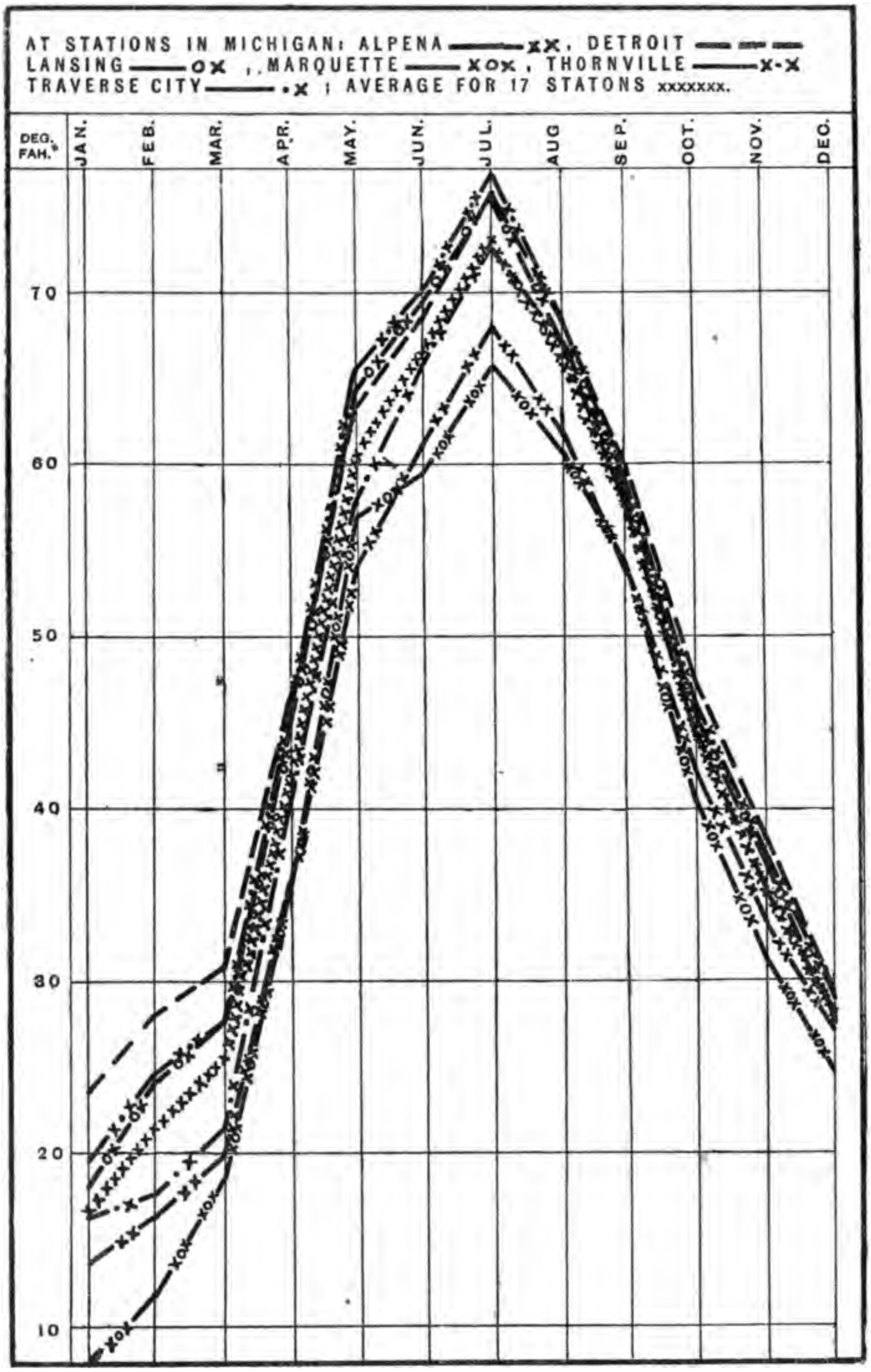
A At Marquette a whirling psychrometer was used in 1887.

a For 92 observations. b For 91 observations. c For 90 observations. d For 89 observations.
e For 87 observations. f For 86 observations. g For 84 observations. h For 83 observations.
i For 82 observations. j For 81 observations. k For 75 observations. l For 74 observations.
m For 73 observations. n For 69 observations. o For 65 observations. p For 57 observations.

§ This line is an average for only the stations from which statements, nearly complete, were received for every month in the year. It does not include Swartz Creek, Battle Creek, Ionia, Port Austin, and Ripley.

¶ The average for 7 months in 1887 is 83. ‖ For 7 months, 79. ** For 6 months, 79. †† For 8 months, 74. ‡‡ For 11 months, 83.

DIAGRAM I.—AVERAGE TEMPERATURE, BY MOS., IN 1887.



*SCALE, 10° F. TO .92 IN. VERTICALLY.

H. B. T., DEL. DES. BY H. B. B.

TABLE I.—*Average Temperature in Degrees Fahr., for the Year, and for each Month of the Year 1887, at each of 17 Stations in Michigan, and also the Average for the 17 Stations. From Observations made Daily at 7 A. M., 2 P. M. and 9 P. M.,* by Observers † for the State Board of Health, and for the U. S. Signal Service.*

Stations in Michigan.† (Those of the U. S. Signal Service in Italics.)	Division of the State.‡	Temperature in Degrees Fahr.													
		Year.		Months, ¶ 1887.											
		Norm. ‖	1887.	Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 17 Stations §..	....	......	44.82	16.58	21.57	25.55	42.09	60.68	66.53	73.22	66.41	57.95	44.46	35.18	27.57
Ripley..................	U. P.	......	††	5.05	10.57	18.45	36.32	57.67	.....	.....	65.56	.....	....	.....	.....
Marquette..............	U. P.	^{2}39.35	38.97	8.00	12.00	18.70	35.50	56.80	59.50	65.85	60.74	54.28	40.40	31.20	24.70
Gulliver Lake...	U. P.	......	40.03	9.41	12.10	19.16	35.87	57.44	63.10	67.13	62.62	54.26	41.23	31.50	26.58
Escanaba...............	U. P.	^{16}40.25	38.98	7.60	^{d}13.00	19.20	34.40	54.40	62.10	63.50	62.13	54.60	40.90	31.00	24.80
Traverse City..........	N. W.	^{5}42.47	43.83	16.25	^{d}17.81	21.54	40.39	58.05	65.82	72.72	67.08	58.20	44.48	35.24	28.35
Mackinaw City........	N.	^{4}40.03	39.88	13.30	16.10	20.10	33.90	49.30	58.70	67.90	63.00	^{b}54.20	42.30	33.20	26.50
Alpena.................	N. E.	^{15}41.13	40.62	13.70	16.40	19.90	35.70	54.10	61.10	68.20	61.60	53.80	42.30	33.50	27.10
Grand Haven..........	W.	^{16}46.56	45.72	20.10	24.11	27.28	43.52	59.50	66.10	72.43	65.49	58.52	45.60	36.20	29.73
Port Austin	B. & E.	......	‡‡	.....	.....	.....	.....	.....	62.63	73.10	66.19	59.01	46.15	36.89	28.48
Port Huron.............	B. & E.	^{13}44.98	45.23	19.00	24.10	25.60	41.70	57.10	64.40	73.40	66.70	59.20	46.10	36.90	28.60
Thornville..............	B. & E.	^{11}47.77	47.55	19.52	24.58	27.77	45.61	65.43	70.26	76.97	68.54	59.28	46.19	37.40	29.03
Agricultural College	C.	^{24}46.46	46.60	18.20	24.26	28.29	45.37	64.28	68.53	75.51	67.96	58.86	44.97	35.66	27.30
Ionia....................	C.	......	§§	19.66	23.75	29.16	46.42	64.99	71.38	.....	.....	.....	.....	36.52	28.58
Lansing, S. B. of H...	C.	^{9}47.29	46.69	18.26	24.39	27.81	45.27	64.24	69.44	75.76	67.06	58.66	45.19	36.59	27.63
Swartz Creek..........	C.	......	‖‖	17.81	23.24	27.30	44.50	64.00	68.81	75.98	67.19	.....	.....	.....	.....
Otsego	S. W.	......	47.69	18.39	26.07	29.47	47.90	65.91	71.09	76.90	69.35	60.02	44.67	35.44	27.06
Ann Arbor..............	S. C.	^{7}46.09	47.28	19.50	25.30	29.10	44.50	64.00	69.60	77.70	68.70	59.70	45.50	36.20	27.50
Battle Creek.	S. C.	......	¶¶	22.43	.....	30.89	48.00	67.53	73.44	80.19	71.45	62 44	47.33	37.86	29.44
Kalamazoo.............	S. C.	^{11}47.63	48.02	18.77	26.02	29.76	47.30	65.54	70.37	77.74	69.98	61.17	46.02	36.18	27.42
Marshall................	S. C.	^{5}48.13	49.92	20.42	28.18	32.20	48.58	67.06	72.79	79.92	71.56	62.71	47.54	38.51	29.52
Birmingham...........	S. E.	......	^{a}46.49	17.89	^{d}24.06	27.48	43.40	^{a}64.99	^{d}69.48	^{c}77.20	^{b}68.21	^{e}57.67	^{a}45.01	35.03	27.43
Detroit	S. E.	^{16}48.34	48.41	23.60	28.20	31.00	46.56	63.40	68.60	75.90	68.30	60.00	47.49	38.38	29.51

---

a, b, c. In the columns from January to December, inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

[a] For 30 days. [b] For 29 days. [c] For 28 days. [d] For 27 days. [e] For 24 days.

*At the U. S. Signal Service Stations for the year 1887, the observations were made at 7 A. M., 3 P. M., and 10 P. M., 75th meridian time, and one-third the sum of the three observations was taken as the daily average. The local time at these stations corresponding to 7 A. M., 3 P. M., and 10 P. M., 75th meridian time, is as follows: At Port Huron, 6:30 A. M., 2:30 P. M., and 9:30 P. M.; at Detroit, 6:28 A. M., 2:28 P. M., and 9:28 P. M.; at Alpena, 6:26 A. M., 2:26 P. M., and 9:26 P. M.; at Grand Haven, 6:15 A. M., 2:15 P. M., and 9:15 P. M.; at Mackinaw City, 6:22 A. M.; 2:22 P. M., and 9:22 P. M.; at Escanaba, 6:20 A. M., 2:20 P. M., and 9:20 P. M.; at Marquette, 6:11 A. M., 2:11 P. M., and 9:11 P. M. At the other stations the observations were made at 7 A. M., 2 P. M., and 9 P. M., local time, and the daily averages were one-third the sum of these three observations.

†The names of observers, their place of observation, and the counties in which these places are situated, are stated in Exhibit 1, page 2.

‡The names of divisions, and the counties in each are stated in Exhibit I., in a paper which follows on weekly reports of sickness.

§This line is an average for only the 17 stations from which statements nearly complete were received for every month of the year. It does not include Ripley, Port Austin, Ionia, Swartz Creek, and Battle Creek.

[The remaining foot-notes are on page 21.]

The lines for 6 representative stations in Table I. are graphically represented in Diagram I., page 18.

TABLE II.—*Extremes of Temperature and Days of Month on which the Highest and for the Year 1887,at each of 17 Stations in Michigan.—As indicated by Daily Readings P. M., by Observers* for the State Board of Health, and for the U. S. Signal Service.*

Line Number.	Stations in Michigan.* (Those of the U. S. Signal Service in Italics.)	Year 1887.			January.		February.		March.		April.		May.	
		Highest.	Lowest.	Range.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
1	At 17 Stations.....†	104	-28	132	54	-28	55	-21	60	-14	82	8	97	28
2	Ripley ....‡	....	....	......	35^{27}	-26^{31}	41^{14}	-20^{1}	68^{12}	$-10^{3,4}$	87^{9}	1^{4}	89^{20}	24^{3}
3	*Marquette* ....§	97	-21	118	37^{28}	-21^{31}	36^{8}	-13^{4}	46^{2}	-14^{5}	82^{9}	9^{5}	88^{21}	33^{4}
4	Gulliver Lake......‡	85	-28	113	41^{28}	-28^{5}	$35^{7,8,28}$	$-19^{1,19,20}$	$44^{10,12}$	-14^{4}	$56^{21,28}$	8^{4}	85^{10}	28^{2}
5	*Escanaba*...........§	86	-24	110	39^{28}	-24^{31}	36^{7}	-17^{13}	44^{7}	-12^{5}	57^{10}	9^{5}	77^{10}	32^{4}
6	Traverse City......‡	104	-15	119	39^{20}	-15^{20}	46^{7}	-15^{12}	48^{12}	-7^{4}	69^{9}	14^{4}	97^{21}	34^{17}
7	*Mackinaw City*....§	89	-14	103	42^{16}	-14^{31}	41^{8}	-12^{1}	$39^{9,21}$	-10^{5}	69^{10}	9^{5}	83^{2}	32^{4}
8	*Alpena*..............§	93	-16	109	47^{20}	-16^{31}	48^{8}	-15^{13}	45^{7}	-8^{5}	75^{9}	9^{5}	83^{20}	35^{4}
9	Harrisville ....‡	101	-21	122	45^{20}	-17^{30}	48^{8}	-21^{12}	45^{7}	-5^{4}	71^{10}	10^{4}	90^{20}	30^{3}
10	*Grand Haven*......§	91	-7	98	48^{22}	-2^{19}	46^{8}	-7^{1}	60^{12}	7^{30}	$73^{13,14}$	16^{5}	84^{11}	42^{3}
11	Port Austin.......‡	....	....	......	......	......	......	......	......	......	......	......	......	......
12	*Port Huron*.........§	99	-9	108	49^{23}	-9^{11}	53^{6}	1^{1}	46^{24}	4^{29}	74^{10}	16^{5}	89^{21}	40^{6}
13	Thornville..........‡	98	-22	120	52^{23}	-22^{8}	54^{8}	-8^{13}	$48^{2,9,24}$	$12^{4,5,25,26}$	76^{10}	$20^{4,5}$	93^{21}	44^{4}
14	Agr'l College......‡	98	-26	124	46^{23}	-26^{6}	52^{8}	0^{1}	53^{9}	-1^{29}	$76^{9,10}$	14^{4}	88^{21}	38^{3}
15	Ionia.................‡	....	....	......	46^{23}	-15^{3}	52^{9}	-9^{1}	54^{13}	2^{29}	80^{10}	14^{5}	90^{23}	$40^{1,4}$
16	Lansing, State B. of H...............‖‡	96	-20	116	48^{23}	-20^{7}	53^{8}	-3^{1}	$50^{9,12}$	5^{23}	77^{9}	16^{4}	90^{21}	41^{3}
17	Swartz Creek.....‡	....	....	......	53^{22}	$-25^{5,6}$	53^{8}	-8^{1}	$50^{9,24}$	-3^{29}	$76^{9,10}$	15^{4}	93^{21}	37^{3}
18	Ann Arbor.........¶	98	-12	110	52^{23}	-12^{11}	53^{8}	-3^{1}	51^{9}	5^{29}	$74^{9,1}$	15^{5}	88^{21}	45^{1}
19	Battle Creek......‡	....	....	......	53^{23}	-5^{31}	......	......	55^{12}	3^{28}	77^{12}	16^{4}	88^{21}	40^{3}
20	Hudson...............‡	....	....	......	52^{23}	-23^{6}	50^{8}	4^{12}	......	......	82^{12}	16^{15}	91^{20}	$39^{3,18}$
21	Kalamazoo.........‡	98	-12	110	50^{23}	-12^{11}	55^{8}	0^{1}	59^{12}	7^{29}	78^{12}	$18^{4,5}$	89^{21}	$45^{4,26,27}$
22	Marshall ....‡	102	-15	117	52^{23}	-15^{6}	55^{8}	4^{1}	56^{12}	4^{28}	80^{12}	18^{4}	92^{21}	43^{3}
23	Birmingham.......‡	102	-17	119	49^{23}	-17^{7}	51^{8}	-4^{12}	47^{2}	3^{25}	73^{9}	15^{4}	96^{21}	$39^{3,14}$
24	*Detroit*...............§	101	-3	104	54^{23}	-3^{11}	54^{8}	1^{1}	52^{2}	7^{29}	72^{10}	18^{5}	87^{21}	45^{16}

NOTE.—The small figures above and at the right of numbers denoting the degrees of temperature, state the day or days of the month on which the highest or the lowest temperature occurred.

*** The names of observers, etc., are stated in Exhibit 1, page 2.**

† The line No. 1, and the three columns for the year 1887, relate only to the 17 stations from which observations were received for every month of the year. It does not include Port Austin, Ionia, Swartz Creek, Battle Creek, Hudson and Ripley.

‡ For stations marked thus ‡, the daily readings of registering thermometers recorded at 7 A. M. for the preceding calendar day.

§ At the stations of the U. S. Signal Service the observations with registering thermometers were read and recorded at 10 P. M., 75th Meridian time.

¶ At Ann Arbor the registering thermometers were read and recorded at 9 P. M.

‖ Beginning with the year 1885 allowance must be made for Lansing in Table II.,because of a change in the location of the instruments. The amount of the variation by months is shown in Exhibit B. on page 22, Report for 1886.

**** At Ripley the highest temperature for August was obtained from the tri-daily readings of the dry bulb of psychrometer.**

the Lowest Temperature occurred by Months of the year 1887; also, Extremes and Range of Registering Thermometers, or by Observations made daily at 7 A. M., 2 P. M. and 9

June.		July.		August.		September.		October.		November.		December.		Line Number.
Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	
98	40	104	39	98	37	91	26	80	11	70	-6	56	-6	1
				96$^{** 9}$	41$^{26, 28}$									2
91^{7}	41^{10}	97^{15}	46^{23}	89^{8}	40^{26}	82^{6}	33^{24}	77^{8}	13^{25}	65^{6}	-5^{28}	42^{4}	-4^{30}	3
82^{6}	43$^{24, 25}$	85^{16}	42^{22}	81^{2}	39^{25}	75^{4}	26^{23}	66^{2}	11^{25}	54$^{2, 7}$	-6^{29}	43$^{3, 4}$	5$^{28, 29}$	4
80^{16}	43^{25}	86^{15}	44^{23}	82^{11}	38$^{25, 26}$	80^{6}	29^{24}	68^{8}	11^{25}	65^{7}	-5^{28}	42^{4}	-6^{28}	5
98^{15}	43^{10}	104^{16}	45^{22}	94$^{1, 4}$	38^{27}	87^{5}	27^{23}	78^{8}	18$^{25, 26, 29}$	62$^{6, 7}$	8^{28}	50^{4}	6^{25}	6
79^{8}	44^{1}	89^{8}	49^{23}	88^{8}	46^{27}	76^{6}	32^{24}	75^{8}	21^{30}	62$^{6, 7}$	6^{30}	49^{4}	7^{29}	7
88^{16}	44^{11}	91^{16}	44^{24}	93^{4}	40^{25}	82^{13}	28^{24}	75^{8}	15^{26}	64$^{6, 7}$	7^{29}	54^{4}	6^{30}	8
94^{16}	40^{25}	101^{16}	39^{23}	90^{18}	38^{28}	87^{13}	29$^{23, 25}$	78^{8}	10^{25}	65^{7}	2^{28}	55^{4}	1$^{29, 30}$	9
84$^{20, 30}$	48^{2}	90^{27}	52$^{23, 24}$	91^{10}	46$^{25, 29}$	82$^{4, 6}$	32^{24}	76^{7}	20^{26}	59^{2}	13^{28}	53^{4}	5^{28}	10
86^{16}	50$^{9, 19, 25}$	93^{16}	55$^{18, 23, 24}$	91^{5}	46^{28}	87^{13}	36^{25}	77^{10}	20^{25}	64^{7}	12$^{29, 30}$	55^{4}	9$^{21, 22}$	11
88$^{16, 17, 30}$	48^{27}	99^{17}	53^{23}	92^{3}	44^{28}	86^{13}	33^{26}	77^{8}	20^{26}	60$^{2, 7}$	12^{29}	52^{4}	6^{30}	12
92^{30}	50^{25}	98$^{15, 17}$	51^{24}	96$^{3, 4}$	43^{28}	90^{6}	33^{24}	80^{8}	20^{26}	70^{7}	13^{29}	55^{4}	7$^{22, 30}$	13
91^{29}	43^{24}	98$^{15, 17}$	54^{24}	98^{3}	37^{28}	88^{5}	26^{23}	73^{7}	12^{25}	65^{7}	13^{28}	56^{8}	-3^{29}	14
										65^{8}	13^{29}	51^{4}	2^{30}	15
90^{17}	46$^{24, 27}$	96$^{16, 17}$	45^{23}	93^{3}	39$^{28, 29}$	87^{5}	27^{23}	72$^{7, 8}$	13^{25}	65$^{2, 7, 8}$	10^{28}	54^{2}	-3^{29}	16
94^{30}	41^{26}	100$^{15, 17}$	41^{23}	98$^{3, 4}$	37^{27}									17
89^{30}	48^{24}	98^{17}	51^{24}	94^{3}	44^{28}	87^{13}	32^{24}	75^{7}	19^{26}	64^{7}	12$^{29, 30}$	55^{4}	3^{30}	18
89^{30}	49$^{23, 26}$	96^{17}	50^{23}	94^{3}	44$^{26, 28, 29}$	85^{5}	30^{23}	75^{7}	17^{25}	64^{7}	12^{28}	57^{3}	0^{29}	19
92$^{20, 30}$	41^{24}	97^{27}	45^{23}	100^{3}	38^{29}	89$^{5, 13}$	24^{23}	81^{7}	14^{25}	58$^{4, 26}$	7^{28}	43^{11}	-8^{29}	20
88$^{17, 29}$	50$^{23, 25, 26}$	98^{17}	58$^{23, 24}$	95^{10}	53$^{24, 26}$	86^{1}	34^{24}	77^{7}	20^{26}	66^{7}	12$^{22, 29}$	53^{4}	3^{30}	21
94^{29}	49$^{23, 24}$	102^{17}	52$^{23, 25}$	98^{3}	43^{24}	88^{5}	32^{23}	77^{7}	17^{25}	67^{7}	12^{28}	54^{4}	-2^{29}	22
96$^{17, 29}$	42$^{24, 25}$	102$^{15, 16}$	49^{25}	98^{3}	39^{27}	89^{13}	27^{23}	77^{7}	16^{25}	63^{7}	10^{28}	55^{4}	-3^{30}	23
88^{16}	50^{24}	101^{17}	54^{24}	93^{3}	49^{28}	91^{13}	33^{24}	75^{7}	22^{26}	64^{7}	16^{29}	55^{4}	7^{30}	24

Foot-notes from page 19]

‖ Numbers in this column state the average annual temperature for periods of years ending in each case with December 31, 1887. The small figures above and at the right of numbers which state the temperature, denote the number of years included in the average.

¶ The computations of Av. Temp., as tabulated for months in 1887, were made at the following stations: Marquette, Escanaba, Grand Haven, Detroit, Ann Arbor, Alpena, Port Huron, and Mackinaw City. All other computations in Table I. were made at the office of the State Board of Health.

** Beginning with the year 1885, allowance must be made for Lansing in Table I., because of a change in the location of the instruments. The amount of the variation by months is shown in Exhibit A, on page 22, Report for 1886.

†† The average for 6 months in 1887 is 32.27. ‡‡ For 7 months, 53.21. §§ For 8 months, 40.06. ‖‖ For 8 months, 48.60. ¶¶ For 11 months, 51.90.

EXHIBIT 6.—*Comparison of the Average Temperature during the Year and during each month of the Year, 1887, with the Annual and with the Monthly Averages for the Year 1886, and with the Averages for the 23 Years, 1864–86. Observations made by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Michigan.*

Years, Etc.	Average Temperature.—Degrees Fahr.												
	Annual An.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 23 yr's, 1864–86	46.45	21.66	23.75	31.07	45.72	58.09	67.65	71.47	68.80	60.41	48.47	35.29	25.31
1886..................	46.20	18.78	22.27	31.33	50.18	58.06	65.72	70.68	69.30	62.07	52.37	33.94	19.74
1887..................	46.60	18.20	24.26	28.29	45.37	64.28	68.53	75.51	67.96	58.86	44.97	35.66	27.30
In 1887 **Higher** than Average for 23 yrs.—1864–86.....	0.15	......	0.51	......	......	6.19	0.88	4.04	......	......	......	0.37	1.99
In 1887 **Lower** than Average for 23 yrs.—1864–86.....	......	3.46	......	2.78	0.35	......	......	......	0.84	1.55	3.50	......	......
In 1887 **Higher** than in 1886........	0.40	......	1.99	......	......	6.22	2.81	4.83	......	......	......	1.72	7.56
In 1887 **Lower** than in 1886........	......	0.58	......	3.04	4.81	......	......	......	1.34	3.21	7.40	......	......

EXHIBIT 7.—*Average Temperature,* by Year and Months, for the 8 Years, 1879–86. Observations made at Office State Board of Health, State Capitol, Lansing, Michigan.*

Years, Etc.	Average Temperature.—Degrees Fahr.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 8 y'rs, 1879–86...	47.37	21.20	23.89	31.39	46.11	58.92	67.39	72.49	69.39	62.42	52.05	36.70	26.47
1886..................	46.19	19.02	22.44	32.09	50.16	57.77	66.20	70.87	68.49	61.81	51.78	34.02	19.61
1887..................	46.69	18.26	24.39	27.81	45.27	64.24	69.44	75.76	67.06	58.66	45.19	36.59	27.63
In 1887 **Higher** than Average for 8 years, 1879-86.....	......	......	0.50	......	......	5.32	2.05	3.27	......	......	......	......	1.16
In 1887 **Lower** than Average for 8 years, 1879-86.......	0.68	2.94	......	3.58	0.84	......	......	......	2.33	3.76	6.86	0.11	......
In 1887 **Higher** than in 1886........	0.50	......	1.95	......	......	6.47	3.24	4.89	......	......	......	2.57	8.02
In 1887 **Lower** than in 1886........	......	0.76	......	4.28	4.89	......	......	......	1.43	3.15	6.59	......	......

* Beginning with the year 1885, slight allowance should be made for Lansing in Exhibit 7, because of a change in the location of the instruments. The amount of the variation by months is shown in Exhibit A, on page 22, Report for 1886.

EXHIBIT 8.—*Average Daily Range of Temperature, by year and months in 1887, compared with Annual and Monthly Averages for the 8 years, 1879-86. These Averages are for Groups of several Stations in Michigan.**

Years, Etc.	Average Daily Range of Temperature—Degrees Fahr.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average for 8 years 1879-86*	18.29	16.34	18.23	18.02	19.41	20.83	20.62	20.50	19.84	19.74	17.69	14.69	13.56
1886 (18 stations*)	18.53	13.65	17.40	15.93	20.11	21.87	22.02	22.94	19.77	18.83	19.31	15.11	15.44
1887 (17 stations*)	18.46	17.96	17.06	18.02	19.52	22.52	20.68	21.91	20.81	19.79	16.50	14.80	11.88
In 1887 **Greater** than Av. 8 years, 1879-86	0.17	1.62	......	0	0.11	1.69	0.06	1.41	0.97	0.05	......	0.11	......
In 1887 **Less** than Av. 8 years, 1879-86	......	......	1.17	......	......	......	......	......	......	......	1.19	......	1.68
In 1887 **Greater** than in 1886	......	4.31	......	2.09	......	0.65	......	......	1.04	0.96	......	......	......
In 1887 **Less** than in 1886	0.07	......	0.34	......	0.59	......	1.34	1.03	......	......	2.81	0.31	3.56

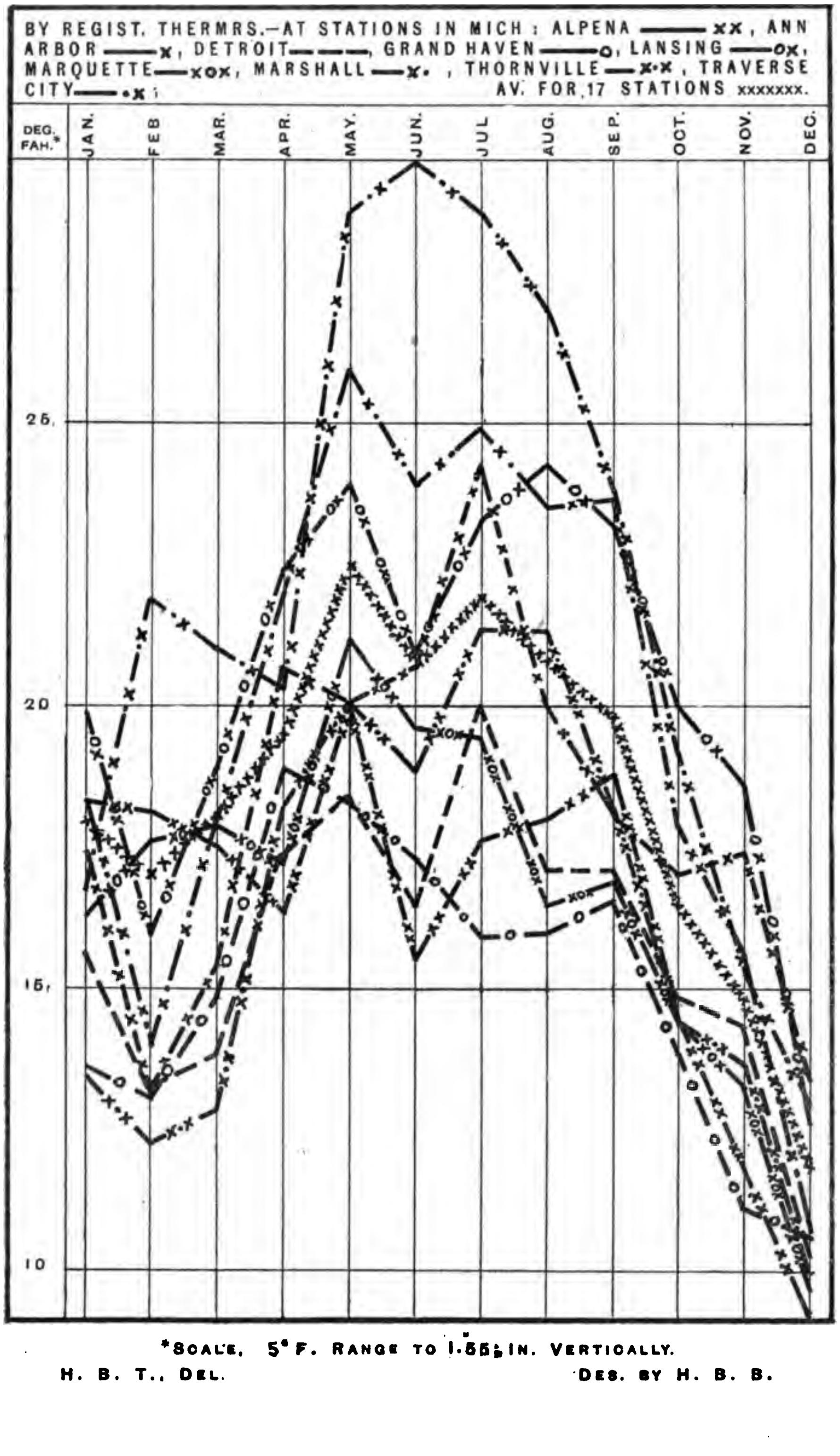
* Marquette for 1879-84 and 1886-7; Grand Haven, Lansing, Detroit for 1879-87; Otisville for 1879-80 and 1882; Battle Creek for 1879-80; Escanaba, Alpena, Port Huron, Thornville for 1880-87; Kalamazoo for 1880-83 and 1886-7; Adrian for 1880; Agricultural College for 1881-7; Traverse City, Marshall for 1882-7; Harrisville for 1882 and 1885-7; Reed City for 1882 and 1884-5; Ann Arbor for 1882-3 and 1885-7; Washington for 1882-3; Winfield for 1883; Tecumseh for 1883-5; Manistique, Ionia, Swartz Creek for 1884-5; Mackinaw City for 1884-7; Hillsdale for 1884; Pentwater, East Saginaw, Hudson for 1886 Birmingham, Gulliver Lake for 1887.

EXHIBIT 9.—*Comparisons of the Average Daily Range of Temperature for the Year and for each Month of the Year 1887, with Averages for the 13 years, 1874–86, and for the Year 1886. Observations made with Registering Thermometers by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Michigan.*

Years, Etc.	Average Daily Range of Temperature.—Degrees Fahr.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 13 yrs., 1874-86*	20.99	16.70	19.23	19.18	22.47	24.71	23.47	24.97	25.50	23.95	20.51	16.18	15.03
1886	20.60	13.52	16.71	15.90	20.87	23.45	23.03	27.23	24.03	21.20	22.55	18.87	19.81
1887	21.81	20.77	17.36	20.45	23.53	26.26	22.13	26.10	26.42	23.90	20.06	17.27	17.48
In 1887 **Greater** than Av. for 13 yrs., 1874-86	0.82	4.07	......	1.27	1.06	1.55	......	1.13	0.92	......	......	1.09	2.45
In 1887 **Less** than Av. for 13 years, 1874-86	......	......	1.87	......	......	......	1.34	......	......	0.05	0.45	......	......
In 1887 **Greater** than in 1886	1.21	7.25	0.65	4.55	2.66	2.81	......	......	2.39	2.70	......	......	......
In 1887 **Less** than in 1886	......	......	......	......	......	......	0.90	1.13	......	......	2.49	0.60	2.33

* For the years 1874-6, 1878, 1879 (except Nov. and Dec.), and 1880, the computations were made from the report of observations published in the Reports of the State Board of Agriculture for those years. For 1877, 1881, (except Jan.), 1882-87, the computations were made from registers or copies of registers supplied by Dr. Kedzie.

DIAGRAM II.—AV. DAILY RANGE OF TEMP.; BY MOS., 1887



*SCALE, 5° F. RANGE TO 1.55½ IN. VERTICALLY.

H. B. T., DEL. DES. BY H. B. B.

TABLE III.—*Average Daily Range of Temperature, by Registering Thermometers, during the Year and during each Month of the Year 1887, at each of 17 Stations in Michigan, and Average for the 17 Stations.*

Stations in Michigan.* (Those of the U. S. Signal Service in Italics.)	Divisions of the State.†	Norm. ‡	Average Daily Range of Temperature.—Degrees Fahr.												
			Yr. 1887.	Months, 1887.											
				Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 17 Stations.§..	....	......	18.46	17.96	17.06	18.02	19.52	22.52	20.68	21.91	20.81	19.79	16.50	14.80	11.88
Marquette............	U. P.	17.20^{2}	16.66	16.31	17.63	17.90	17.22	21.20	19.60	19.40	16.50	16.90	14.40	13.20	9.70
Gulliver Lake........	U. P.	......	21.63	22.61	25.57	28.32	21.07	27.68	21.53	19.87	22.45	23.43	17.94	16.70	12.42
Escanaba............	U. P.	16.52^{8}	16.20	19.10	19.80	19.30	14.80	17.70	14.40	15.60	16.90	17.17	15.10	$\overset{c}{12.50}$	12.00
Traverse City........	N. W.	19.13^{6}	22.13	16.74	21.89	21.06	20.33	28.74	29.70	$\overset{a}{28.73}$	27.03	23.87	19.19	15.27	12.97
Mackinaw City.......	N.	15.76^{4}	15.86	19.10	20.00	20.50	16.30	21.00	15.70	15.40	15.20	14.00	12.50	11.10	9.50
Alpena..............	N. E.	16.35^{8}	16.30	18.30	18.10	17.50	16.30	20.10	15.50	17.60	18.00	18.80	14.40	11.80	9.20
Harrisville..........	N. E.	21.95^{3}	22.72	22.94	23.04	22.52	21.60	26.87	28.27	31.32	25.55	22.63	19.35	15.07	13.45
Grand Haven.........	W.	14.06^{9}	15.00	13.60	12.98	14.82	18.92	18.27	17.28	15.91	16.04	16.64	13.77	11.11	10.65
Port Austin..........	B. & E.	......	¶	.....	.....	.....	.....	.....	$\overset{d}{14.00}$	16.81	15.35	15.57	15.87	13.47	11.84
Port Huron..........	B. & E.	16.05^{8}	15.80	15.38	12.93	11.29	17.32	17.59	19.25	18.99	18.85	17.92	14.72	14.40	11.00
Thornville...........	B. & E.	16.70^{8}	16.24	13.42	12.21	$\overset{d}{12.81}$	18.23	20.65	18.73	21.39	21.32	18.23	14.32	13.63	9.97
Agricultural College.	C.	20.31^{6}	21.81	20.77	17.36	20.45	23.53	26.26	22.13	26.10	26.42	23.90	20.06	17.27	17.48
Ionia................	C.	......	**	19.81	18.04	18.68	23.30	27.26	23.83	.....	.....	.....	.....	.....	.....
Lansing, S. B. of H...	C.	19.47^{9}	20.34	19.87	16.04	18.90	22.43	23.90	20.97	23.32	24.26	23.23	20.06	18.57	12.58
Swartz Creek.........	C.	......	††	21.23	18.50	18.94	21.70	26.74	24.47	29.03	27.77	.....	.....	.....	.....
Ann Arbor	S. C.	18.13^{6}	18.12	17.40	13.10	15.40	20.70	20.00	20.70	24.20	$\overset{a}{20.00}$	18.10	17.00	17.40	13.40
Battle Creek.........	S. C.	......	‡‡	17.55	.....	18.39	23.67	25.48	22.27	21.65	21.39	23.20	18.48	15.67	15.29
Hudson...............	S. C.	......	§§	17.84	12.46	.....	21.47	28.48	25.90	28.77	29.32	25.93	20.19	16.80	12.13
Kalamazoo............	S. C.	16.93^{2}	16 1	14.61	14.63	16.29	22.07	21.16	17.60	17.58	16.26	18.20	15.42	15.45	12.44
Marshall.............	S. C.	19.45^{6}	19.86	18.42	14.04	17.87	22.00	26.06	23.93	24.94	23.48	23.63	17.84	15.63	10.77
Birmingham...........	S. E.	......	22.69	21.13	$\overset{d}{17.44}$	17.58	21.73	27.34	$\overset{c}{29.82}$	32.15	28.40	$\overset{b}{24.69}$	19.61	18.28	14.15
Detroit	S. E.	15.79^{9}	15.70	$\overset{e}{15.60}$	13.20	13.80	17.30	18.40	16.50	20.00	17.10	17.10	14.80	14.30	10.30

---

* The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1, page 2.

†For counties in each division see Exhibit I, in a paper which follows on weekly reports of diseases.

‡Numbers in this column state the annual average range of temperature for periods of years ending in each case with Dec. 31, 1887. The small figures above and at the right of numbers which state the range of temperature, denote the number of years included in the average.

§ This line is an average for all stations for which statements nearly complete are given for every month of the year. It does not include the lines for Ionia, Swartz Creek, Battle Creek, Port Austin and Hudson.

¶ The average for 7 months in 1887 is 14.70. ** For 6 months, 21.82. †† For 8 months, 23.55. ‡‡ For 11 months, 20.28. §§ For 11 months, 21.75.

a, b, c, In the columns from January to December, inclusive, the letters a, b, c, etc. stand directly above the numbers from which they refer to the notes below.

a For 30 days. b For 29 days. c For 28 days. d For 27 days. e For 16 days.

NOTE.—Graphic representations of statements in Table III., are given in Diagram II., page 24.

EXHIBIT 10.—*Comparisons of the Extremes and the Range of Temperature (Degrees Fahr,) during the Year, and during each month of the Year 1887, with the Average of the Extremes, and of the Range, for the Fourteen Years, 1873–86; also, Statement of the Extremes and of the Range for each of the Fourteen Years, 1873–86. Observations made with Registering Thermometers (except for the first two months of 1873, and for those two months with an ordinary Thermometer, at 7 A. M., 2 P. M. and 9 P. M.) Daily, by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Mich. For Nov. and Dec., 1879, the observations were made by Harry B. Turner, at the Office of the State Board of Health, Lansing.*

Year and Months.	Extremes and Ranges of Temperature.—Degrees F.																																															
	1873.			1874.			1875.			1876.			1877.			1878.			1879.*			1880.			1881.			1882.			1883.			1884.			1885.			1886.			Av. for 4 years, 1873-86.			1887.*			1887 Higher (+), or lower (-), than Av. 14 years, 1873-86.		
	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.
Year	94	-30	124	101	-7	108	94	-33	127	96	-19	115	93	-14	107	98	-7	105	97	-18	115	94	-17	111	100	-17	117	89	-10	99	91	-20	111	90	-25	115	90	-24	114	93	-18	111	94	-19	113	98	-26	124	+4	-7	+11
Av. Month	74	15	59	77	15	62	75	10	64	74	19	56	74	20	54	73	22	51	76	15	61	74	20	54	73	22	52	72	23	49	71	14	57	71	14	58	68	15	53	74	17	57	73	17	56	74	17	57	+1	=	+1
January	43	-30	73	59	-7	66	35	-13	48	65	6	59	52	-9	61	48	-4	52	44	-18	62	62	9	53	37	-9	46	50	-2	52	41	-19	60	44	-22	66	42	-22	64	50	-12	62	48	-11	59	46	-26	72	-2	-15	+13
February	49	-13	62	48	-1	49	42	-33	75	59	-1	60	56	10	46	55	-7	62	41	-6	47	59	-2	61	48	-17	65	57	12	45	50	-20	70	52	-18	70	45	-24	69	52	-18	70	51	-10	61	52	0	52	+1	+10	-9
March	57	-12	69	67	8	59	75	-11	86	60	0	60	51	-14	65	72	18	54	66	4	62	55	6	49	50	9	41	66	16	50	52	-8	60	57	-13	70	44	-13	57	65	5	60	60	0	60	53	-1	54	-7	-1	-6
April	82	24	58	68	3	65	80	0	80	74	16	58	81	18	63	75	29	46	81	12	69	76	20	56	83	9	74	73	21	52	83	14	69	74	21	53	81	17	64	80	16	64	78	16	62	76	14	62	-2	-2	=
May	84	27	57	96	21	75	89	24	65	89	31	58	90	26	64	77	29	48	91	25	66	87	40	47	89	33	56	79	28	51	80	31	49	80	28	52	85	26	59	83	34	49	86	29	57	88	38	50	+2	+9	-7
June	94	42	52	95	34	61	89	33	56	95	42	53	89	40	49	94	39	55	95	33	62	92	41	51	86	40	46	87	44	43	87	42	45	89	43	46	86	40	46	90	41	49	91	40	51	91	43	48	=	+3	-3
July	92	44	48	98	43	55	92	44	48	96	46	50	91	43	48	98	47	51	97	47	50	94	50	44	95	52	43	89	47	42	90	45	45	89	44	45	90	47	43	93	45	48	93	46	47	98	44	54	+5	-2	+7
August	94	44	50	101	41	60	93	35	58	96	36	60	93	43	50	93	42	51	96	34	62	88	43	45	100	46	54	89	49	40	91	32	59	90	36	54	84	42	42	91	37	54	93	40	53	98	37	61	+5	-3	+8
September	89	26	63	95	30	65	94	26	68	80	36	44	85	38	47	92	31	61	85	27	58	88	30	58	97	43	54	85	32	53	86	28	58	89	36	53	80	35	45	87	35	52	88	32	56	88	26	62	=	-6	+6
October	79	16	63	76	16	60	77	18	59	75	19	56	87	26	61	82	21	61	87	15	72	76	24	52	75	30	45	77	24	53	77	22	55	81	22	59	72	17	55	80	30	50	79	21	57	73	12	61	-6	-9	+4
November	56	1	55	70	3	67	60	2	58	62	12	50	55	4	51	52	15	37	75	13	62	62	-4	66	64	12	52	70	14	56	63	7	56	59	10	49	62	21	41	70	3	67	63	8	55	65	13	52	+2	+5	-3
December	64	10	54	50	-6	56	70	-1	71	41	-19	60	58	13	45	36	-2	38	58	-3	61	47	-17	64	56	12	44	40	-10	50	55	-2	57	53	-25	78	48	-7	55	50	-13	63	52	-5	57	56	-3	59	+4	+2	+2

*For the fourteen years, 1873-87, the highest temperature was 101°, August 11, 1874; the lowest was -33°, February 8, 1875, and the range was 134°, F.

EXHIBIT 11.—*Average Absolute Humidity, by Year and Months, in 1887, compared with Annual and Monthly Averages for 1886, and for the 10 Years 1877–86.* These Averages are for Groups of several Stations in Michigan.†*

Years, Etc.	Absolute Humidity—Grains of Vapor in a Cubic foot of Air.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 10 yrs., 1877-86†..	3.44	1.38	1.51	1.81	2.75	3.91	5.27	6.07	5.84	4.98	3.71	2.30	1.73
1886 (16 stations†)....	3.32	1.32	1.48	1.82	3.11	3.82	4.98	5.59	5.75	4.94	3.64	2.02	1.36
1887 (16 stations).....	3.29	1.25	1.45	1.49	2.63	4.43	5.50	6.29	5.22	4.37	2.98	2.16	1.77
In 1887 **Greater** than Av. for 10 yrs., 1877–86..............	......	......	......	......	......	0.52	0.23	0.22	......	......	......	......	0.04
In 1887 **Less** than Av. for 10 years, 1877–86..............	0.15	0.13	0.06	0.32	0.12	......	......	......	0.62	0.61	0.73	0.14	......
In 1887 **Greater** than in 1886..........	......	......	......	......	......	0.61	0.52	0.70	......	......	......	0.14	0.41
In 1887 **Less** than in 1886..............	0.03	0.07	0.03	0.33	0.48	......	......	......	0.53	0.57	0.66	......	......

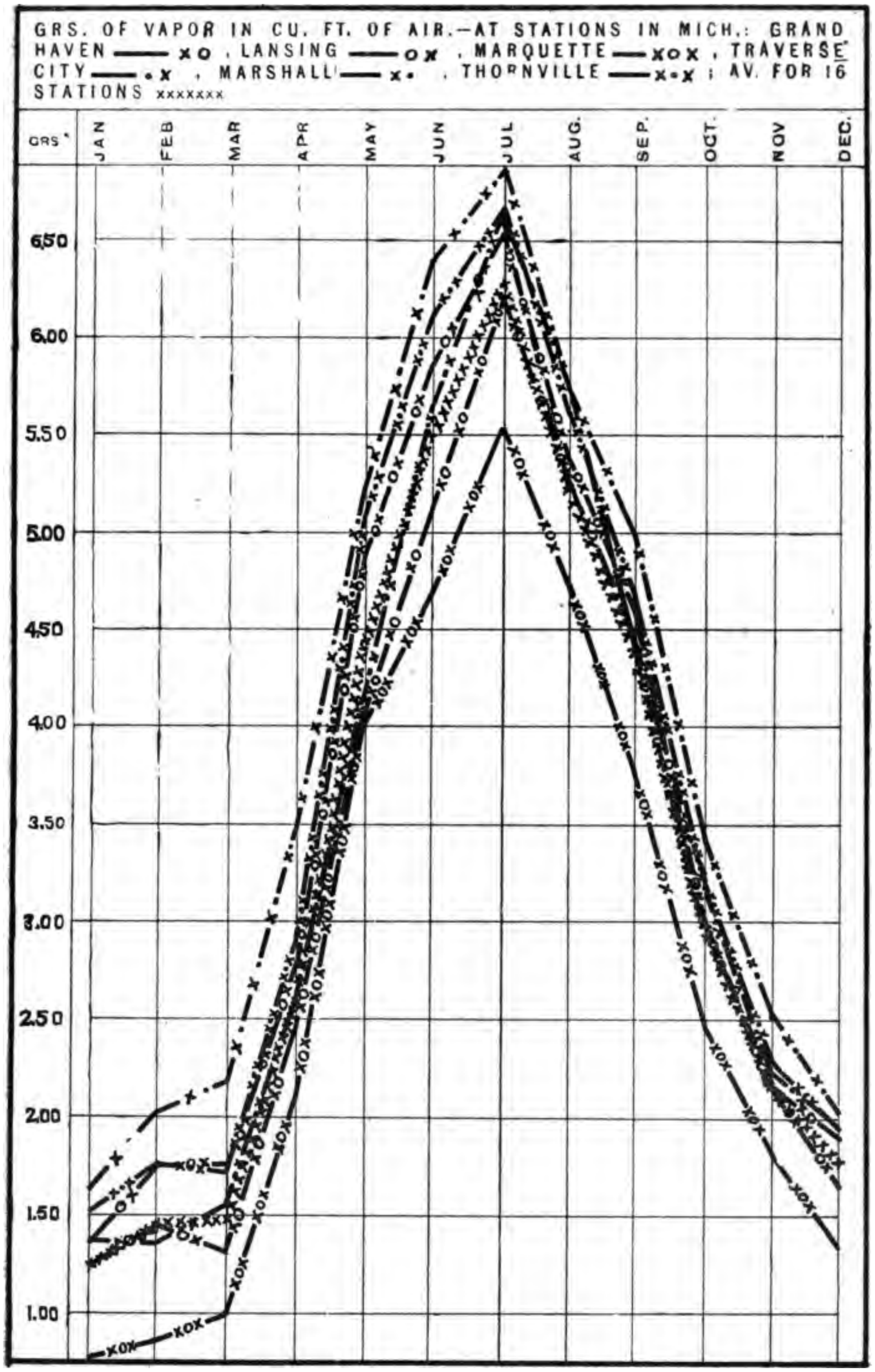
* Beginning with the year 1885, allowance must be made for Lansing in Exhibit 11, because of a change in the location of the instruments. The amount of variation by months is shown in Exhibit C., on page 23, Report for 1886.

† Thornville, Detroit for 1877-86; Kalamazoo for 1877-83 and 1886; Mendon for 1877-82; Tecumseh for 1878-85; Battle Creek for 1877-9, 1882 and 1885; Otisville for 1878-80, and 1882; Marquette for 1879-84, and 1886; Alpena, Grand Haven, Port Huron, Lansing for 1879-86; Agricultural College for 1877-86; Niles for 1878-9 and 1881; Nirvana for 1878-9 and first 4 months of 1880; Reed City for last 8 months of 1880 and 1881-5; Benton Harbor, Coldwater for 1877-8; Escanaba for 1880-7; Washington for 1880-3; Petoskey for 1879; Winfield for 1881 and 1883; Ann Arbor for 1881-6; Woodmere Cemetery (near Detroit) for 1877-9; Traverse City, Marshall for 1882-6; Harrisville for 1882 and 1885-6; Parkville, Hastings for 1882; Hillsdale for 1883-4; Manistique and Swartz Creek for 1884-5; Mackinaw City for 1884-6; Ionia for 1884; Pentwater for 1886.

EXHIBIT 12.—*Comparison of the Average Absolute Humidity for the Year, and for each Month of the Year 1887, with averages for the 21 Years 1866–86, and for the Year 1886. Observations made at 7 A. M., 2 P. M., and 9 P. M., daily, by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Mich.*

Years, Etc.	Absolute Humidity—Grains of Vapor in a Cubic Foot of Air.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 21 yrs., 1866–86...	3.48	1.44	1.54	1.86	2.69	4.04	5.62	6 46	6.00	4.87	3.38	2.18	1.65
1886....................	3.50	1.42	1.66	1.94	3.41	4.57	5.42	5.45	5.84	5.18	3.62	2.05	1.39
1887....................	3.41	1.41	1.67	1.66	2.72	4.81	5.75	6.24	5.07	4.48	3.03	2.24	1.78
In 1887 **Greater** than Av. for 21 yrs., 1866–86..............	......	......	.13	......	.03	.77	.13	......	......	......	......	.06	.13
In 1887 **Less** than Av. for 21 years, 1866–86..............	.07	.03	......	.20	......	......	......	.22	.96	.39	.35	......	......
In 1887 **Greater** than in 1886..........	......	......	.01	......	......	.24	.33	.79	......	......	......	.19	.39
In 1887 **Less** than in 1886................	.09	.01	......	.28	.69	......	......	......	.77	.70	.59	......	......

DIAGRAM III.—ABSOLUTE HUMIDITY, BY MOS., IN 1887.



*SCALE ONE GRAIN OF VAPOR (IN A CU. FT. OF AIR) TO 1.04 IN VERTICALLY

H. B. T. DEL — DES. BY H. B. B

TABLE IV.—ABSOLUTE HUMIDITY.—*The Average Number of Grains of Vapor of Water in a Cubic Foot of Air for Months and Year 1887, at 16 Stations in Michigan.—Average of Observations made Daily at 7 A. M., 2 P. M., and 9 P. M.,* by Observers† for the State Board of Health, and for the U. S. Signal Service.*

Stations in Michigan.† (Those of U. S. Signal Service in Italics.)	Divisions of the State.‡	Grains of Vapor in a Cubic Foot of Air—(Absolute Humidity.)‖													
		Year.		Months, 1887.											
		Norm. §	1887.	Jan.	Feb.	Mar.	Apr.	May.	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 16 stations ¶	....	......	3.29	1.25	1.45	1.49	2.63	4.43	5.50	6.29	5.22	4.37	2.98	2.16	1.77
Ripley	U. P.	......	**	0.94	1.11	1.49	2.58	4.15	.....	.....	5.21	4.33	.....	.....	.....
Marquette, B	U. P.	^{2}2.77	2.75	0.76	0.86	1.00	2.10	4.00	4.68	5.53	4.72	3.77	2.46	1.79	1.33
Gulliver Lake	U. P.	......	3.04	1.05	1.13	1.32	2.33	3.93	4.99	5.92	5.03	3.96	2.90	2.10	1.81
Escanaba	U. P.	^{8}2.87	2.85	0.80	[i] 0.93	1.05	2.19	3.86	[d] 4.91	5.96	4.86	3.86	2.49	1.76	1.49
Traverse City	N. W.	^{6}3.38	3.40	1.36	[h] 1.36	1.54	2.60	4.15	5.66	6.62	5.73	[d] 4.46	3.17	2.22	1.94
Mackinaw City	N.	^{4}2.86	2.80	0.87	0.95	0.95	2.06	3.41	4.64	5.97	4.67	3.81	2.74	1.93	1.64
Alpena	N. E.	^{9}2.94	2.94	1.06	1.17	1.16	2.23	3.80	4.92	5.90	4.70	3.88	2.75	2.02	1.74
Grand Haven	W.	^{9}3.42	3.21	1.24	1.44	1.30	2.45	4.06	5.12	6.21	[a] 5.26	4.47	2.98	2.16	[a] 1.88
Port Austin	B. & E.	......	††	.....	.....	.....	.....	.....	5.47	6.90	[a] 5.50	4.62	[c] 3.27	[d] 2.30	[m] 2.06
Port Huron	B. & E.	^{9}3.33	3.33	1.23	1.42	1.43	[d] 2.68	4.45	5.37	6.45	5.37	4.39	3.04	2.26	1.82
Thornville	B. & E.	^{11}3.72	3.62	1.51	1.75	1.72	2.89	5.08	6.11	6.67	5.60	4.66	3.21	2.30	1.95
Agrl. College	C.	^{8}3.52	3.41	1.41	1.67	1.66	2.72	4.81	5.75	6.24	5.07	4.48	3.03	2.24	1.78
Ionia	C.	......	‡‡	.....	1.89	1.92	3.02	5.04	6.31	.....	.....	.....	.....	[j] 2.21	[c] 2.14
Lansing, S.B. of H., A	C.	^{9}3.40	3.47	1.36	1.73	1.74	2.79	4.87	5.85	6.52	5.37	4.58	2.98	2.15	1.64
Swartz Creek	C.	......	§§	[f] 1.32	[i] 1.55	1.56	2.65	4.74	5.93	6.44	5.20	.....	.....	.....	.....
Ann Arbor ¶¶	S. C.	^{7}3.43	3.63	[g] 1.52	[j] 1.76	[a] 1.61	2.74	4.98	6.28	[d] 6.79	[b] 5.56	4.80	3.42	2.34	1.81
Battle Creek	S. C.	......	‖‖	[h] 1.51	.....	[l] 2.05	[k] 3.69	[f] 5.93	[d] 7.33	8.26	6.74	5.68	3.72	2.71	2.15
Kalamazoo	S. C.	^{9}3.51	3.55	1.56	1.88	1.88	3.06	4.80	5.86	6.27	5.24	4.68	3.14	2.27	2.00
Marshall	S. C.	^{6}3.72	3.87	1.63	2.02	2.18	3.47	5.23	6.39	6.85	5.72	4.99	3.39	[d] 2.53	2.04
Birmingham	S. E.	......	3.43	[a] 1.32	[j] 1.47	1.53	2.73	[a] 4.91	[f] 5.95	[e] 6.45	[b] 5.41	[l] 4.62	2.94	2.20	1.66
Detroit	S. E.	^{11}3.54	3.40	1.39	1.69	1.77	2.98	4.46	5.51	6.23	5.14	4.53	3.11	2.24	1.79

---

* At the U. S. Signal Service stations for the year 1887, the observations were made at 7 A.M., 3 P.M., and 10 P.M., 75th Meridian time. The local time corresponding to these hours is stated in the star (*) footnote to Table I., page 19.

† The names of observers, their places of observation, and the counties in which these places are situated are stated in Exhibit 1, page 2.

‡ The full names of the divisions and the counties in each division are stated in Exhibit I, in a paper which follows, on weekly reports of sickness.

§ Numbers in this column state the average annual Absolute Humidity for periods of years ending in each case with Dec. 31, 1887. The small figures above and at the right of numbers which state the Absolute Humidity, denote the number of years included in the average.

‖ The number of grains of vapor in a cubic foot of air at each observation was determined from readings of the psychrometer by means of Glaisher's table, Table XII. of the Smithsonian Meteorological and Physical Tables (1859).

¶ This line is an average for only the stations from which statements, nearly complete, were received for every month in the year. It does not include the lines for Swartz Creek, Battle Creek, Ionia, Port Austin, and Ripley.

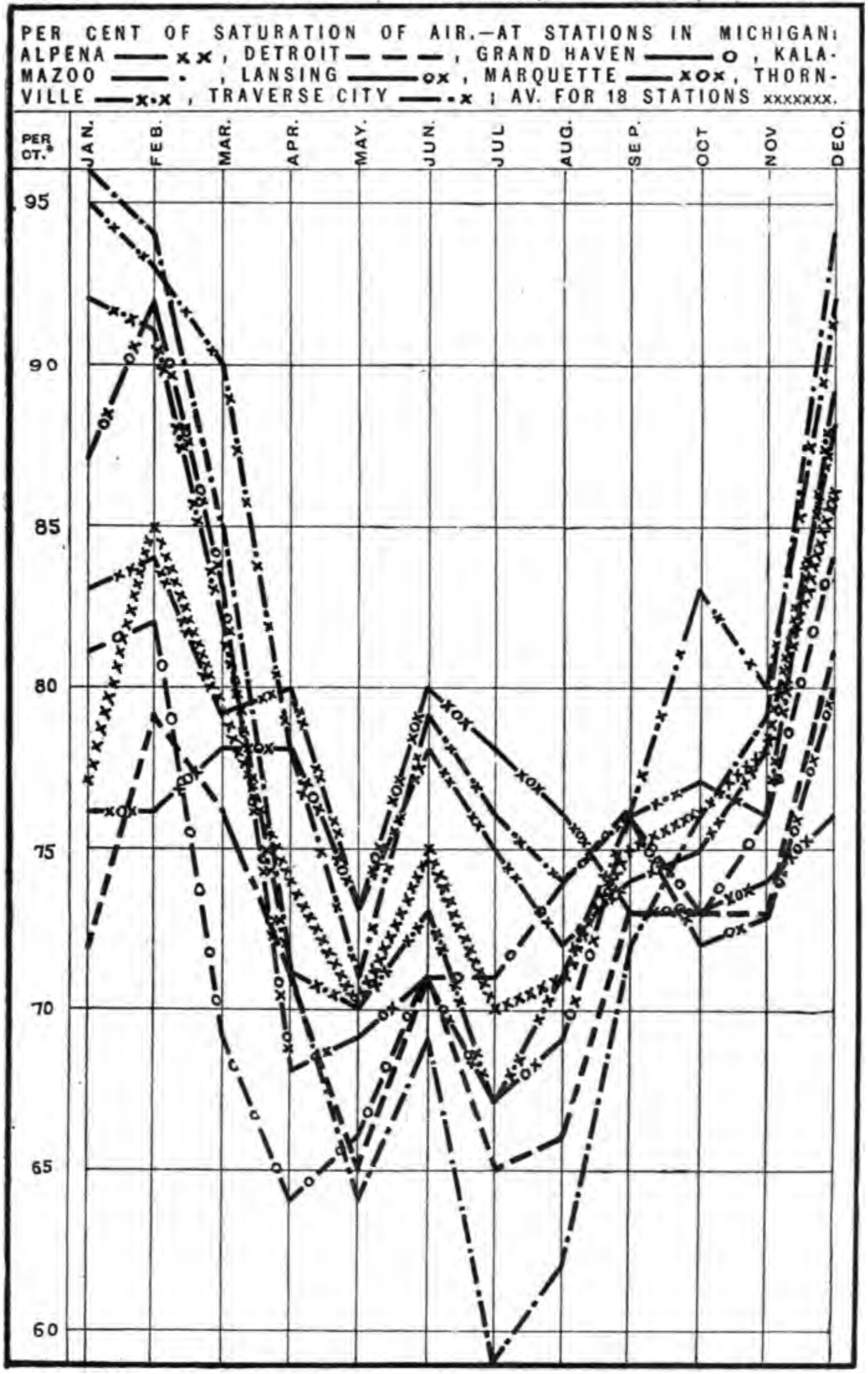
** The average for 7 months in 1887, is 2.83. †† For 7 months, 4.30. ‡‡ For 7 months, 3.22. §§ For 8 months, 3.67. ‖‖ For 11 months, 4.52.

A Beginning with the year 1885, allowance must be made for Lansing in Table IV., because of a change in the location of the instruments. The amount of the variation by months is shown in Exhibit C, page 23, Report for 1886.

[The remaining foot-notes are on page 17.]

The lines for 6 stations in Table IV. are graphically represented in Diagram III., page 28.

DIAGRAM IV.—RELATIVE HUMIDITY, BY MOS., IN 1887.



*SCALE, TEN PER CENT OF SATURATION TO 1.72 IN. VERTICALLY

H. B. T., DEL. DES. BY H. B. B.

TABLE V.—RELATIVE HUMIDITY.—*Average Per Cent of Saturation of the Atmosphere with Vapor of Water during the Year, and during each Month of the Year 1887, at 16 Stations in Michigan.—Average of Observations made Daily at 7 A. M., 2 P. M., and 9 P. M.,* by Observers† for the State Board of Health, and for the U. S. Signal Service.*

Stations in Michigan.† (Those of the U. S. Signal Service in Italics.)	Divisions of the State.†	Per Cent of Saturation.—Relative Humidity.													
		Year.		Months, 1887.											
		Norm. ‡	1887.	Jan	Feb.	Mar.	Apr.	May	June	July.	Aug.	Sept.	Oct	Nov.	Dec.
Av. for 16 Stations§	......	......	77	85	85	79	74	70	75	70	71	75	76	78	86
Ripley	U. P.	......	¶	91[o]	93	95	87	70	....	.....	71[n]	72[p]	.....	.....	.....
Marquette, A	U. P.	77[9]	76	76	76	78	78	73	80	78	76	73	73	74	76
Gulliver Lake	U. P.	......	83	95	93	87	83	67	73	79	75	76	84	86	92
Escanaba	U. P.	75[8]	77	79	78[h]	74	84	77	76	76	74	73	72	74	82
Traverse City	N. W.	84[6]	82	95	93[h]	90	78	71	79	76	74	76[d]	83	80	92
Mackinaw City	N.	75[4]	74	68	69	63	77	77	81	79	69	72[e]	76	76	85
Alpena	N. E.	76[9]	78	83	84	79	80	73	78	75	72	74	75	78	88
Grand Haven	W.	75[9]	74	81	82	69	64	66	71	71	74	76	73	76	84
Port Austin	B. & E.	......	‖	.....	.....	.....	.....	.....	82	77	74[a]	76	78[c]	77[d]	91[m]
Port Huron	B. & E.	77[9]	77	76	78	78	75	77	79	73	73	74	74	77	85
Thornville	B. & E.	79[10]	78	92	91	82	71	70	73	67	71	76	77	76	89
Agr'l College	C.	79[24]	76	90	89	78	66	68	73	65	66	75	75	80	87
Ionia	C.	......	**	.....	.....	88	70	69	72	.....	.....	.....	.....	75[j]	98[c]
Lansing, S. B. of H.§§	C.	72[9]	76	87	92	83	68	69	71	67	69	76	72	73	80
Swartz Creek	C.	......	††	81[f]	85[i]	78	66	67	75	67	70	.....	.....	.....	.....
Ann Arbor	S. C.	78[7]	78	85[g]	87[j]	74[a]	70	71	78	67[d]	71[b]	79	85	81	86
Battle Creek	S. C.	......	‡‡	81[h]	.....	85[l]	81[k]	77[f]	81[d]	75	78	86	89	90	95
Kalamazoo	S. C.	76[2]	77	96	94	85[a]	71	64	69	59	62	72	76	79	94
Marshall	S. C.	77[6]	79	94	94	89	77	68	71	62	66	74	78	81[d]	90
Birmingham	S. E.	......	75	85[a]	80[j]	76	74	68[a]	75[f]	64[d]	70[b]	79[i]	73[a]	80	81
Detroit	S. E.	72[10]	72	72	79	76	71	65	71	65	66	73	73	73	81

NOTE.—The tri-daily observations with the psychrometer at Marquette, Escanaba, Mackinaw City, Grand Haven, Port Huron and Detroit for 1886 were reduced (by tables in "Signal Service Order No. 41, 1881, and in Instructions to Voluntary Observers," 1882), and the monthly means for those months were computed, by the observers at those stations. In all other cases the observations were reduced by Guyot's table, in Smithsonian Meteorological Tables, or by a table substantially the same as that. Computations for Ann Arbor for each month in 1887 were made by the observers there. All other computations in Table V. were made at the office of the State Board of Health.

* At the stations of the U. S. Signal Service for the year 1887, the observations were made at 7 A. M., 3 P. M., and 10 P. M., 75th Meridian time. The corresponding local time for each of these stations is stated in the star (*) foot-note to Table I., page 19.

† The names of observers, their places of observation, and the counties in which these places are situated are stated in Exhibit 1, page 2. The full names of the divisions and the counties in each division are stated in Exhibit I., in a paper which follows on weekly reports of diseases.

‡ Numbers in this column state the average annual Relative Humidity for periods of years ending in each case with Dec. 31, 1887. The small figures above and at the right of the numbers which state the Relative Humidity, denote the number of years, included in the average.

[The remaining foot-notes are on page 17.]

Graphic representations of 9 representative lines in Table V. are given in Diagram IV., page 30.

EXHIBIT 13.—*Average Relative Humidity, by Year and Months, in 1887,*[*] *compared with Annual and Monthly Averages for 1886, and for the Nine Years, 1878-86. These Averages are for Groups of several Stations in Michigan.*[†]

Years, Etc.	Per Cent of Saturation.—Relative Humidity.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 9 Yrs., 1878-86[†]	75	81	80	77	69	68	72	72	74	75	76	79	82
1886 (16 stations[†])	77	85	82	80	76	72	72	71	75	78	75	76	82
1887 (16 stations)	77	77	85	79	74	70	75	70	71	75	76	78	86
In 1887 **Greater** than Av. for 9 yrs., 1878-86	2	......	5	2	5	2	3	......	......	0	0	......	4
In 1887 **Less** than Av. for 9 yrs., 1878-86	......	4	......	......	......	......	......	2	3	0	0	1	......
In 1887 **Greater** than in 1886	0	......	3	......	......	......	3	......	......	......	1	2	4
In 1887 **Less** than in 1886	......	8	......	1	2	2	......	1	4	3	......	......	......

[*] Beginning with the year 1885, allowance must be made for Lansing in Exhibit 13, because of a change in the location of instruments. The amount of the variation is shown in Exhibit D, on page 23, Report for 1886.

[†] Thornville and Detroit for 1878-86; Kalamazoo for 1878-83 and 1886; Mendon for 1878-82; Tecumseh for 1878-85; Otisville for 1878-80 and 1882; Nirvana and Woodmere Cemetery (near Detroit) for 1878-9; Nirvana and Reed City for 1880; Ann Arbor for 1881-6; Niles for 1878-9 and 1881; Marquette for 1879-84 and 1886; Alpena, Grand Haven, Port Huron, Lansing for 1879-86; Agricultural College for 1878-86; Escanaba for 1880-6; Washington for 1880-3; Coldwater for 1878: Petoskey for 1879; Mallory Lake and Hudson for 1881; Marshall, Traverse City for 1882-6; Hillsdale for 1882-4; Hastings for 1882; Harrisville for 1882 and 1885-6; Winfield for 1883; Reed City for 1881-5; Battle Creek for 1878-9, 1882, 1885; Manistique, Swartz Creek, for 1884-5; Mackinaw City for 1884-6; Ionia for 1884; Pentwater for 1886.

EXHIBIT 14.—*Comparison of the Average Relative Humidity of the Air (Per Cent of Saturation) for the Year and for each Month of the Year 1887, with Averages for the 23 Years, 1864-86, and for 1886. Observations made at 7 A. M., 2 P. M., and 9 P. M. Daily, by Prof. R. C. Kedzie, at the State Agricultural College near Lansing, Michigan.*

Years, Etc.	Per Cent of Saturation.—Relative Humidity.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 23 years, 1864-86	79	86	86	84	71	69	76	74	77	80	79	82	87
1886	78	91	86	80	73	79	78	65	71	80	73	78	87
1887	76	90	89	78	66	68	73	65	66	75	75	80	87
In 1887 **Greater** than Average for 23 years, 1864-86	......	4	3	......	......	......	......	......	......	......	......	......	0
In 1887 **Less** than Average for 23 yrs, 1864-86	3	......	......	6	5	1	3	9	11	5	4	2	0
In 1887 **Greater** than in 1886	......	......	3	......	......	......	0	0	......	......	2	2	0
In 1887 **Less** than in 1886	2	1	......	2	7	11	5	0	5	5	......	......	0

DIAGRAMS RELATING TO METEOROLOGICAL CONDITIONS.

Most of the diagrams in this paper are to be read by tracing each irregular line across the diagram from left to right, and noting at what point it intersects each of the perpendicular lines having the name of the month at the top. What station is represented by the irregular line may be learned from the head of the diagram. The degree of value denoted by the intersection may be learned by referring to the figures in the left-hand column. Thus, in Diagram I., page 18, relating to average temperature in 1887, tracing the line "—× ×" representing Alpena, it may be seen that the average temperature at Alpena was, in January, about 14°, in February, 16°, in May about 54°, in July about 68°, in October about 42°, etc. Definite numerical statements of the average temperature for each month at each station may be found in Table I., page 19, and accompanying each diagram is a table giving exact numerical statements for the conditions represented. The average line given in each table is the corresponding diagram represented by an × line, thus × × × × × ×. The lines in the diagrams give more ready general comparisons of stations with each other, or of months with each other, than is possible from the mere numerical statements. By Diagram II., page 24, it appears at a glance that the average daily range of temperature at Traverse City, in 1887, was, during June, higher than at any other of the eight stations represented in that diagram, and during December was lower at Alpena. The marked agreement in the course of the lines in Diagram I., page 18, representing mean monthly temperature at six stations, and also that the agreement is closer in the last four months of the year than in earlier months, appear at once on reference to the diagram. The resemblance between the lines in Diagram I., page 18, relating to mean temperature by months in 1887, and those in Diagram III, page 28, relating to absolute humidity of the atmosphere for the same periods, is apparent. By Diagram X., page 59, it appears that in every month of the year the highest velocity of the wind (on an average for the month) is reached between 1 P. M. and 3 P. M., and that the lowest velocity occurs in the latter part of the night or in early morning, and that in 1887, at Lansing, the months of most wind were January, February and April. By reference to Diagram XI., page 61, it may be seen that at other stations in Michigan where records of actual miles of wind traveled were kept, January and November were, in 1887, the months of greatest wind. These statements illustrate the reading of the diagrams for any use it may be desired to make of the tables and diagrams. The three diagrams relating to direction of the wind are constructed on a different principle and the manner of reading them is explained on pages following in this article.

METEORS.

Feb. 9, 9 A. M., was seen in N. W. at an altitude of about 70° and burst in bright red flame at an altitute of about 20°. Sky clear except a few cirrus clouds.—*Swartz Creek.*

Feb. 19, very large and bright; course, south to north, east of zenith.—*Boyne City.*

March 22, 4:05 A. M., course E. to W., 10 seconds duration; March 22, 9 P. M., course from under Pleiades to N. W.; March 30, 9 P. M., course zenith to south; April 1, 11:25 P. M., course E. to W.; April 2, 1:35 A. M., course N. to S.; April 10, 12:05 A. M.. course S. to N.; May 21, 11:15 P. M., course S. to N. W.; May 22, 12:55 A. M., course S. to N. W.; June 14, 11:05 P. M., course S. to N.; June 28, 10:35 P. M., course S. to N. W.; June 29, 1:10 A. M., course S. to N.; July 8, 8:50 P. M., course E. to N.; July 29, 12:45 A. M., course N. to S.: July 29, 2:25 A. M., course N. to S,; July 29, 9:50 P. M., course N. to S.; July 29, 10:40 P. M., course E. to W.; July 30, 12:20 A. M., course N. to S.; July 30, 8:50 P. M., course S. E to N. W. under Northern Cross; Aug. 5, 8:25 P. M., course zenith to E. across Constellation Dolphin; Aug. 7, 8:23 P. M., course W. to E.; Aug. 7, 8:30 P. M., course E. to W.; Aug. 7, 8:35 P. M., course W. to E.; Aug. 7, 8:37 P. M., course across zenith; all meteors seen on Aug. 7 were west of Pegasus; Aug. 11, from 9 to 9:15 P. M., seven were seen, course N. to S. under Ursa Major; Aug. 13, 2:10 A. M., course E. to W.: Aug. 19, 12:05 A. M., one, course N. to S., and one E. to W.—*Kalamazoo.*

Sept. 13, 11 P. M., small, course north.—*Thornville.*

Sept. 13, 7:25 P. M., course W. to E. over Scorpio.; Sept. 13, 8 P. M., course N. to S, over Sagittarius; Sept. 17, 1:05 A. M., course due E. to W.; Sept. 18, 12:05 A. M., one, course E. to W. and one E. to N.—*Kalamazoo.*

Oct. 27, 9 P. M., course W. to E., zenith distance south 45°.—*Kalamazoo.*

Dec. 10, 9:10 P. M., large red meteor, course from under Aries to south.—*Kalamazoo.*

FOGS.

For the year 1887, fog was reported at 257 morning observations, at 87 afternoon observations (at about 2 P. M.), at 89 evening observations (at about 9 P. M.) and 34 times during the day, no special time being mentioned, in many cases the same fog, or fog at the same time, being reported by different observers. Fog was reported, at one or more stations at some time during the day, on 165 days.

EXHIBIT 15.—*Number of Different Days on which Fog was Observed at One or more of 18 Stations* in Michigan in 1887, and in each month of the Year 1887.*

Year 1887.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
165	4	10	5	12	18	19	16	23	22	12	15	9

NOTE.—Graphic representations of statements in Exhibit 15 are given in Diagram V., page 35.

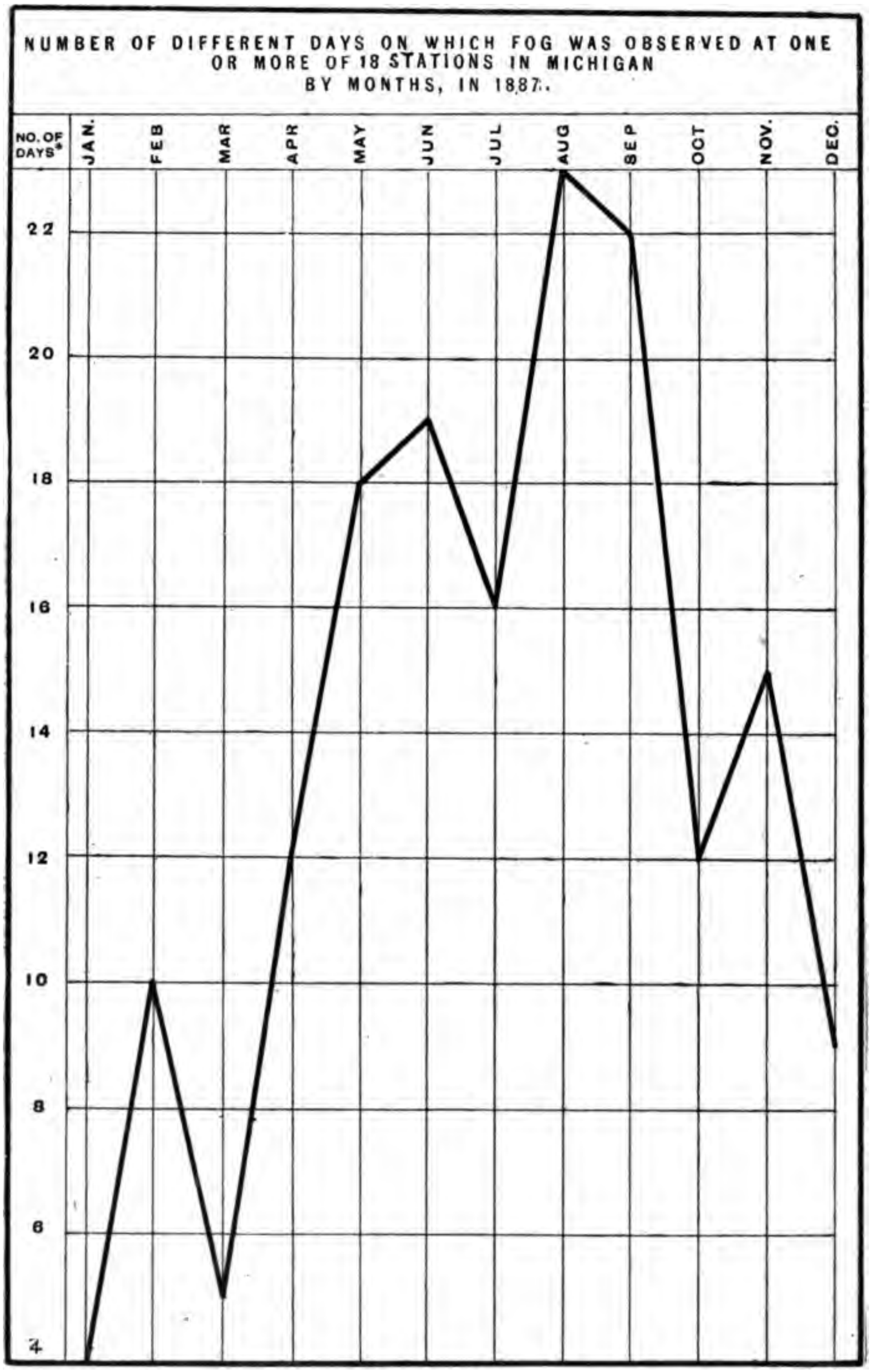
* This exhibit contains statements only for those localities from which reports were received for every month of the year, as follows: Marquette, Gulliver Lake, Escanaba, Traverse City, Mackinaw City, Alpena, Grand Haven, Harrisville, Port Huron, Thornville, Lansing, Agricultural College, Ann Arbor, Kalamazoo, Marshall, Parkville, Birmingham and Detroit.

EXHIBIT 16.—*Number of Observations at which Fog was Observed in Michigan in 1887, and in each Month of the Year 1887. (Observations taken 3 times Daily at 18 Stations.*)*

Year 1887.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
467	15	30	7	23	50	65	22	44	91	40	64	16

* This exhibit contains statements only for those localities from which registers were received for every month of the year, stated in a foot-note to Exhibit 15, above.

DIAGRAM V.—CONCERNING FOGS IN MICHIGAN, IN 1887.



*Scale, One Day to .33 In. Vertically.

H. B. T. Del. Des. by H. B. B.

EXHIBIT 17.—*Number of Different Days on which Fog was recorded in 1887, and in each*

Stations in Michigan.*	No. of days in 1887.	January.			February.			Line Number.
		Day of Month.	Hour of Observation.		Day of Month.	Hour of Observation.		
			A. M.	P. M.		A. M.	P. M.	
Ripley	8	0			0			1
Marquette	29	0			0			2
								3
								4
								5
Gulliver Lake	21	0			0			6
								7
								8
Escanaba	19	0			0			9
								10
Traverse City	10	0			0			11
Mackinaw City	28	22	6:22		0			12
								13
								14
Alpena	30	0			8	8 till	1:00	15
								16
								17
Harrisville	2	0			0			18
Grand Haven	30	8		9:15	6, 8, 17, 18	6:15		19
		22		2:15 & 9:15	7		2:15 & 9:15	20
		23	6:15	2:15				21
East Saginaw		12	9 till	night	18	7:15 till	11	22
Port Austin								23
								24
Port Huron	34	0						25
								26
Thornville	15	22		P. M. & night	10	A. M.	P. M.	27
		23	A. M.					28
Agricultural College	8	0			18	7		29
Lansing, S.B. of H.	19	16	7		8		2 till 3:30	30
		22	10:30	till 6.	18	7 till 9		31
Swartz Creek		0			18	7 till 9		32
								33
Ann Arbor	12	23	Morn'g		10		2	34
					18	7		35
Kalamazoo	23	0			2, 3, 4, 5, 6	A. M.	P. M.	36
Marshall	2	0			0			37
Parkville	28	22		Night.	0			38
		23	Morn'g					39
Birmingham	6	23	7		0			40
Detroit	11	0			7		9:28	41
								42

---

* The names of observers, their places of observation, and the counties in which the places are situated, are stated in Exhibit 1, page 2.

† "No fogs formed during March."—*Port Huron.*

Month, the Dates and hours of observation when Fogs were recorded, at 22 Stations in Michigan.

Line Number.	March.			April.			May.			June.		
	Day of Month.	Hour of Observation.		Day of Month.	Hour of Observation.		Day of Month.	Hour of Observation.		Day of Month.	Hour of Obs-rvation.	
		A. M.	P. M.		A. M.	P. M.		A. M.	P. M.		A. M.	P. M.
1	0			11 to 13 incl'sive	7	2 & 9	14, 30					
2	0			2, 3, 22		2:11	13, 25, 31	6:11	2:11	1, 16, 17	6:11	
3				13, 14	6:11		30	6:11	2:11& 9:11	8, 16		9:11
4				15	6:11	2:11				12		2:11
5				12, 13		9:11				15, 19		2:11& 9:11
6	0			15	7		24	6:30 till 11		6		11 till
7							30	7:30-10:30		7	7 till	2 till 9
8							31	8 till 8		8	till 10	
9	0			1	6:20		9		9:20	6, 16		9:12
10				22	6:20	2:20				7, 17, 18	6:12	
11	0			0			30	7		5,6,8,18	7	
12	0			15, 23	6:22		9	6:22		1,2.18,19 21	6:22	
13				22		9:22	31	6:22	9:22	6, 16, 17		9:22
14				28		2:22				7	6:22	2:22
15	0			4	6 till9:30		7, 8		9:22	1		9:22
16				23	5 till 9	2:22	9, 24	6:22	9:22	2, 18	6:22	
17				28		2:50till3:40	31		2:22	6	6:22	9:22
18	0			0			7			18		
19	30		9:15	1		9:15	11, 13,20 22, 24,27	6:15		5		2:15
20				21	6:15		12, 17, 18		2:15	6	615	2:15
21							23		2:15& 9:15	7,18,25, 28, 29,30	6:15	
22	6	5 till	7	0			0					
23										6	7	2 & 9
24										17		9
25	†			0			16	6:30		6		10:30
26							7, 8, 9			7, 8, 9 18, 28	6:30	
27	0			0			0			2		
28												
29	0			0			0			0		
30	0			0			7	4:00		7	1:00	
31										18	7:00	
32	6	8 till	6	0			0			3, 6		
33										18	3 till7:30	
34	0			0			0			6	7	
35												
36	2, 20	7		0			7, 16	7		7, 18	7	
37	20	7		0			0			0		
38	6, 7, 20			0			7, 8, 16, 18,20,24			6, 7		
39												
40	0			0			0			0		
41	0			0			8		9:28	6, 7, 8, 9	6:28	
42							19	6:28				

Note.—Registers were received, but with no fog recorded thereon, from Otsego for each month in 1887. A cipher (0) indicates that a monthly register was received from the station with no fog recorded thereon.

EXHIBIT 17.——CONTINUED.—*Dates when*

Stations in Michigan.*	July.			August.			September.			Line Number.
	Day of Month.	Hour of Observation.		Day of Month.	Hour of Observation.		Day of Month.	Hour of Observation.		
		A. M.	P. M.		A. M.	P. M.		A. M.	P. M.	
Ripley				0			3, 5, 16	7:00		1
							30		9:00	2
Marquette	12		9:11	11	6:11		30	6:11	2:11 & 9:11	3
	16, 27, 28		2:11							4
	17, 18	6:11								5
Gulliver L'ke	1		9:00	17	7:00		6	7:00		6
	2, 3, 5	7:00					29		9:00	7
	4	7:00	9:00				30	7:00	2:00 & 9:00	8
Escanaba	3	6:12		0			12, 13, 24	6:12		9
							30	6:12	2:12 & 9:12	10
										11
Traverse City	0			0			19, 20 28, 29	7:00	2:00 & 9:00	12
Macki'w City	4, 5		9:22	0			12,24,26 28,29,30	6:22		13
	17	6:22					20		9:22	14
							30		2:22 & 9:22	15
Alpena	0			25	6:26		11		night till	16
							12	10:30		17
							17		night till	18
							18	9:00		19
							20	4 till 10:10		20
							26		night till	21
							27	9:00	night till	22
							28	9:00	night till	23
							29	8:00	night	24
							30	all day		25
Harrisville	0			0			0			26
Gd. Haven										27
	6, 25, 26 27, 31	6:15		1,2,3,6,7 10,13, 17 19, 22, 25	6:15		2,3,4,5,8 10, 12,18 19, 20,24	6:15		28
										29
							20		2:15	30
				15, 16, 18	6:15	2:11	28, 29	6:15	2:15 & 9:15	31
				29, 30, 31			30		9:15	32
Port Austin	13	till 9		0			0			33
Port Huron	0			1	6:00		12, 19,20 21, 26	6:30		34
				2		Night				35
				3	8:00					36
				7		night till				37
				8	8:00	night till				38
				9	7:45	night till				39
				10	7:30					40
				17		night till				41
				18	8:00					42
				22	6:30					43
Thornville	29	7:00		6, 8	Morning		12	Morning		44
										45
										46
Ag'l College	0			22	7:00		12, 18	7:00		47
							29	7:00	9:00	48
Lansing, S.B. of H.	0			18, 22	7:00		12, 18 29, 30	7:00		49
										50
										51
Swartz Creek	0			18, 22	7:00		29	7:00		52
Ann Arbor	0			18	7:00		18	7:00		53
							29	7:00	2:00	54
										55
Kalamazoo	0			15, 18	7:00		18, 29	7:00		56
										57
										58
Marshall	0			0			0			59
Parkville	0			18, 23 27, 28			8, 14, 17, 18, 19,29			60
Birmingham	0			0			5, 12	7:00		61
										62
Detroit	0			0			19	6:28		63
										64

---

* The names of observers, their places of observation, and the counties in which these places are situated are stated in Exhibit 1, page 2.

Fogs were recorded in 1887.

	October.			November.			December.		
Line Number.	Day of Month.	Hour of Observation.		Day of Month.	Hour of Observation.		Day of Month.	Hour of Observation.	
		A. M.	P. M.		A. M.	P. M.		A. M.	P. M.
1									
2									
3	1	6:11	2:11 & 9;11	0			0		
4	2, 8	6:11							
5									
6	1	7:00	2:00 & 9:00	14		2:00 & 9;00	4	7:00	
7	2	7:00	2:00						
8	9	7:00							
9	1	early A.M.	P. M.	2	6:12		13		9;12
10	2	A. M.	6:00	26		9:12			
11	8	6:12							
12	0			22		9:00	0		
13	1, 2	6:22		0			0		
14									
15									
16	1		till night	22		† 6:00	3		till night
17	2	10:00		26	10:00 till	Night	4	10:35	
18									
19									
20									
21									
22									
23									
24									
25									
26	0			0			0		
27	1		2:15 & 9:15						
28	19	6:15		3, 12, 14, 22	6;15		3, 10, 20	6:15	
29	2	6:15	2:15	23	6:15	2:15			
30	9		2:15	26	6:15	2:15 & 9:15			
31	18	6:15	9:15	9		2:15			
32	29		9:15						
33	0			0			3	7:00	
34	6, 7, 19, 20, 26	6:30		23		2:30	14		9:30
35				25		2:30 & 9:30			
36				26	6:30	2:30			
37									
38									
39									
40									
41									
42									
43									
44	0			15	Morning		14, 27, 28		Evening
45				22		P. M.			
46				24, 25	7:00	2:00 & 9:00			
47	19	7:00		1, 19	7:00		0		
48									
49	19	7:00		22	7:00		3	Morning	
50				26		2:00 & 9:00	14	9 till 10:30	
51				9		9:00	14		† 7:30
52									
53	0			25	7:00		3	7:00	9:00
54				23, 26	7:00	2:00			
55				24		2:00 & 9:00			
56	0			3, 9	7:00		14	7:00	
57				7, 16	7:00	2:00			
58				22, 23	7:00	2:00 & 9:00	2		9:00
59	18			0			0		
60	2, 15			1, 25, 26			0		
61	20			2		2:00	0		
62				26	7:00				
63	20	6:28		24		9:28	0		
64				26	6:28				

† Lifted in night.

TABLE VI.—*Average Per Cent of Cloudiness for the Year, and for each Month of the Year 1887, at each of 17 Stations in Michigan, and also the Average for the 17 Stations. Average of Observations made Daily at 7 A. M., 2 P. M. and 9 P. M.,* by Observers for the State Board of Health, † and for the U. S. Signal Service.*

Stations in Michigan.† (Those of the U. S. Signal Service in Italics.)	Division of the State.‡	Average Per Cent of Cloudiness.													
		Year.		Months, 1887.											
		Norm. ‖	1887.	Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 17 Stations...§	....	......	56	70	72	51	56	38	49	36	45	49	63	64	83
Ripley..................	U. P.	......	¶	[i]54	52	45	47	28	.....	.....	[t]47	[w]47	.....	.....	.....
Marquette.............	U. P.	59^{9}	57	63	61	[illegible]	56	33	53	47	51	45	68	71	85
Gulliver Lake.........	U. P.	......	50	54	55	[illegible]	53	28	[i]49	[d]37	[a]39	[g]36	[c]64	60	87
Escanaba..............	U. P.	57^{8}	53	53	[j]62	4	59	33	52	45	45	41	63	65	74
Traverse City	N. W.	60^{6}	59	83	[j]70	[c]47	[j]59	[o]39	[g]50	36	[g]39	[k]46	[a]71	[e]71	91
Mackinaw City........	N.	57^{4}	56	62	60	49	57	32	57	44	41	37	70	68	89
Alpena..................	N. E.	57^{9}	60	76	73	53	63	38	49	46	47	43	68	73	88
Harrisville.............	N. E.	59^{3}	58	77	67	50	60	39	53	35	44	45	65	67	92
Grand Haven..........	W.	59^{9}	61	82	[v]80	56	60	36	57	38	[q]50	52	[i]62	65	90
Port Austin............	B. & E.	......	**	.....	.....	.....	.....	.....	[p]34	[h]16	25	[s]31	55	[r]48	[u]83
Port Huron............	B. & E.	57^{9}	57	73	71	57	62	40	47	35	47	56	57	58	75
Thornville.............	B. & E.	52^{11}	51	70	74	46	46	37	39	24	38	46	58	54	78
Agr'l College..........	C.	58^{24}	55	71	78	54	58	36	47	36	48	48	60	55	74
Ionia	C.	......	††	68	71	46	46	28	35	.....	.....	.....	.....	[j]59	[c]77
Lansing, S. B. of H...	C.	56^{9}	57	67	76	53	53	33	47	38	54	50	61	64	84
Swartz Creek..........	C.	......	‡‡	[b]63	[a]72	50	45	36	43	29	[b]42	[d]47	.....	.....	.....
Otsego	S. W.	40^{2}	41	[l]63	[n]75	[h]46	[f]32	[d]34	[g]27	[a]13	[a]21	[d]27	46	[d]44	[b]66
Ann Arbor..............	S. C.	59^{8}	56	68	81	57	51	45	45	[a]30	45	55	60	59	78
Battle Creek...........	S. C.	......	§§	[c]73	.....	[a]55	50	40	41	28	41	47	56	53	81
Kalamazoo..............	S. C.	67^{11}	59	77	[j]83	[b]56	49	[h]44	49	[a]34	[h]47	[h]57	59	[h]67	[a]85
Marshall................	S. C.	55^{7}	53	70	79	[a]46	51	41	[e]37	21	44	51	55	60	77
Birmingham...........	S. E.	......	59	[d]69	[l]77	[m]52	[h]60	[d]50	[g]52	[i]34	[c]47	[u]63	[c]60	[e]65	[c]81
Detroit.................	S. E.	56^{9}	56	67	74	54	57	42	46	35	43	54	66	60	78

---

* At stations of the U. S. Signal Service the observations were made at 7 A. M., 3 P. M., and 10 P. M., 75th meridian time. The corresponding local time for each of the stations is stated in the star (*) foot note to Table I., page 19.

† The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1, page 2.

‡ The full names of divisions and the counties in each division are stated in Exhibit I. in a paper which follows on weekly reports of sickness.

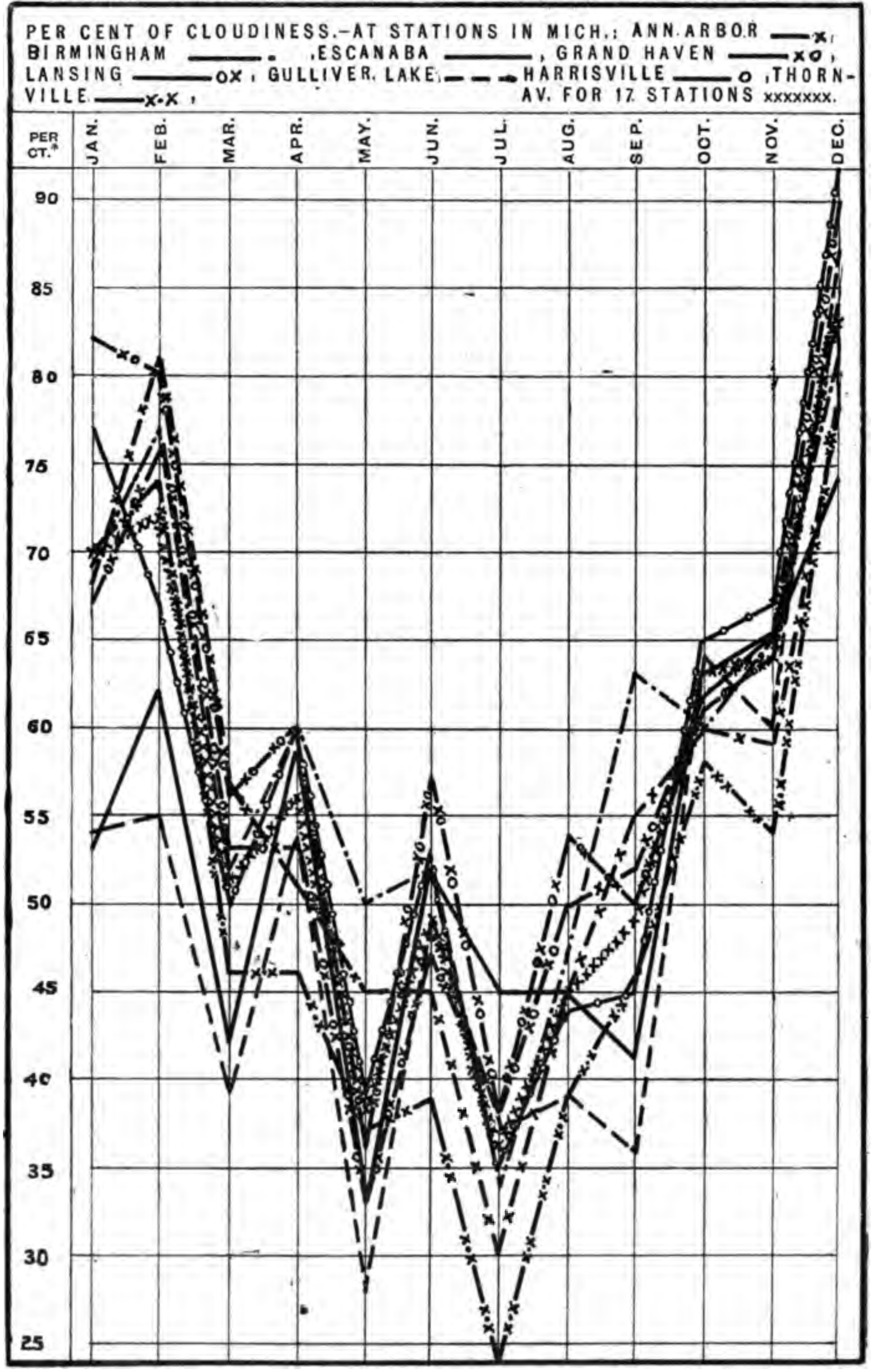
‖ Numbers in this column state the average per cent of cloudiness for periods of years ending in each case with Dec. 31, 1887. The small figures above and at the right of numbers which state the per cent of cloudiness, denote the number of years included in the average.

NOTE TO TABLE VI.—Computations of average per cent of cloudiness were made and furnished by the observers at Escanaba and Ann Arbor for each month in 1887. At Mackinaw City, Aug., Sept., Oct. and Dec. excepted; at Grand Haven, Feb. excepted; at Port Huron, Jan., Feb., Mar., and Oct. excepted. All other computations in Table VI. were made at the office of the State Board of Health.

[The remaining foot-notes are on page 43.]

Graphic representations of 8 representative lines in Table VI., are given in Diagram No. VI., page 41.

DIAGRAM VI.—AV. PER CT. OF CLOUDINESS, MOS., 1887.



*Scale, Ten Per Cent to .94 In. Vertically.

B. T. Del. Des. by H. B. B.

EXHIBIT 18 —*Average Per Cent ofCloudiness, by Year and Months, in 1887, Compared with Annual and Monthly Average for 1886, and for the Ten Years 1877-86. These Averages are for Groups of several Stations in Michigan.**

Years, Etc.	Per Cent of Cloudiness.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 10 years, 1887-86*	56	69	62	60	52	48	47	42	43	46	56	68	77
1886 (18 stations*)	55	80	68	59	53	48	42	36	43	52	45	63	68
1887 (17 stations)	56	70	72	51	56	38	49	36	45	49	63	64	83
In 1887 **Greater** than Av. for 10 years, 1877-86	0	1	10	......	4	......	2	......	2	3	7	......	6
In 1887 **Less** than Av. for 10 years, 1877-86	......	......	......	9	......	10	......	6	......	......	......	4	......
In 1887 **Greater** than in 1886	1	......	4	......	3	......	7	0	2	......	18	1	15
In 1887 **Less** than in 1886	......	10	......	8	......	10	......	......	......	3	......	......	......

* Thornville, Kalamazoo, for 1877-86; Mendon for 1877-83; Tecumseh for 1877-85; Battle Creek for 1877-80 and 1882-85; Nirvana for 1877-9, and the first four months of 1880; Reed City for last 8 months of 1880, and 1881-5; Detroit for 1877 and 1879-86; Niles for 1878-81; Benton Harbor for 1877-8 and 1880; Coldwater, Woodmere Cemetery (near Detroit) for 1877-9; Otisville for 1878-86 and 1882; Marquette for 1879-84 and 1886; Alpena, Grand Haven, Port Huron, Lansing for 1879-86; Washington for 1879-83; Ypsilanti for 1877 and 1879; Agricultural College for 1877-86; Petoskey for 1878-9; Escanaba, Ann Arbor for 1880-6; Fife Lake for 1877; Ionia for 1880 and 1883-5; Adrian for 1880; Hillsdale for 1880 and 1882-4; Marshall for 1881-6; Parkville for 1881-2; Winfield for 1881 and 1883; Hudson and Mallory Lake for 1881; Harrisville for 1882 and 1885-6; Hastings for 1882; Traverse City for 1882-6; Port Austin for 1883; Manistique, Swartz Creek for 1884-5; Mackinaw City for 1884-6; Pentwater, East Saginaw for 1886; Otsego for 1886.

EXHIBIT 19.—*Comparison of the Average Per Cent of Cloudiness in the Year and each Month of the Year 1887, with Averages for the Twenty-three Years, 1864–86, and for the Year 1886. Observations made at 7 A. M., 2 P. M., and 9 P. M., Daily, by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Mich.*

Years, Etc.	Per Cent of Cloudiness.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 23 yrs., 1864-86	58	73	64	62	56	51	50	46	47	49	58	67	76
1886	57	77	65	60	57	46	47	48	44	55	49	64	69
1887	55	71	78	54	58	36	47	36	48	48	60	55	74
In 1887 **Greater** than Av. for 23 yrs., 1864–86	......	......	14	......	2	......	......	......	1	......	2	......	......
In 1887 **Less** than Av. for 23 yrs., 1864-86	3	2	......	8	......	15	3	10	......	1	......	12	2
In 1887 **Greater** than in 1886	......	......	13	......	1	......	......	......	4	......	11	......	5
In 1887 **Less** than in 1886	2	6	......	6	......	10	0	12	......	7	......	9	......

EXHIBIT 20.—*Dates of Auroras Observed and Recorded at 13 Stations in Michigan during the Year 1887.*

Stations.	Dates of Auroras Recorded in 1887.											
	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Ripley	15,22	......	......	......	27	......	......	......	......	......	......	......
Marquette	......	......	19,24	18,19,28,29	......	......	......	......	......	......	......	......
GulliverL'ke	14	11,12,19 20,22	13,15 19,20,26	29	......	19	22	......	15,16,25	13,21,22	......	......
Escanaba.	14,15	12,13,14 19,20,21	19,20	10,11,29	......	9,10	18,19	......	......	......	......	......
Mack'w City	14	12,13,16 19,20,22	15,19,26	18	17,24	19	6,18,19 20	......	25	......	......	......
Alpena	......	12,19	15,19	......	......	......	18	......	......	22	......	......
Harrisville	......	......	......	......	......	......	......	......	25	......	......	......
Port Huron	......	......	......	......	......	26,27	......	......	......	......	......	......
Thornville	......	......	......	......	......	......	......	......	25	......	......	......
Lansing	......	......	......	......	......	......	19	......	25	......	......	......
Swartz Creek	......	12	......	......	......	......	19	......	......	......	......	......
Birmingham	......	......	......	......	......	......	......	......	25	......	......	......
Boyne City	......	19	......	......	......	......	......	......	......	......	......	......

SUNSHINE AND CLOUDS.

The following is a statement of the days in each month in 1887, which were "All or nearly all sunshine," "Clear," "Fair," "Partly cloudy," "All or nearly all cloudy," and the hours of sunshine during each month, as reported by observers at stations in Michigan:

LANSING.

JAN.—Sunny, 1, 2, 3, 4, 7, 18, 19, 21, 24, 26, 27, 29, 30—13 days. Cloudy, 5, 6, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 20, 22, 23, 25, 28, 31—18 days.

FEB.—Sunny, 9, 13, 16, 24, 25, 28—6 days. Cloudy, 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 14, 15, 17, 18, 19, 20, 21, 22, 23, 26, 27—22 days.

MARCH.—Sunny, 1, 2, 3, 4, 7, 8, 12, 14, 15, 16, 19, 20, 23, 25, 26, 29, 30, 31—18 days. Cloudy, 5, 6, 9, 10, 11, 13, 17, 18, 21, 22, 24, 27, 28—13 days.

APRIL.—Sunny, 1, 2, 3, 5, 7, 8, 9, 10, 12, 13, 14, 16, 17, 18, 19, 21, 24, 25, 26, 27, 28, 29, 30—23 days. Cloudy, 4, 6, 11, 15, 20, 22, 23—7 days.

MAY.—Sunny, 1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19, 20, 21, 22, 24, 28, 29—23 days. Cloudy, 5, 17, 23, 25, 26, 27, 30, 31—8 days.

JUNE.—Sunny, 3, 4, 7, 8, 10, 11, 12, 13, 14, 15, 16, 18, 19, 20, 21, 22, 24, 25, 26, 27, 28, 29—22 days. Cloudy, 1, 2, 5, 6, 9, 17, 23, 30—8 days.

JULY.—Sunny, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 19, 20, 23, 24, 25, 26, 27, 28 29, 30, 31—23 days. Cloudy, 1, 2, 3, 4, 5, 18, 21, 22—8 days.

AUG.—Sunny, 1, 2, 6, 7, 8, 9, 12, 19, 24, 25, 26, 28, 29, 30, 31—15 days. Cloudy, 3, 4, 5, 10, 11, 13, 14, 15, 16, 17, 18, 20, 21, 22, 23, 27—16 days.

Foot-notes to Table VI., from page 40.]

§ This line is an average for only the stations from which statements, nearly complete, were received for every month of the year. It does not include the line for Ionia, Swartz Creek, Battle Creek, Otsego, Port Austin, and Ripley.

¶ The average for 7 months in 1887 is 46. ** For 7 months, 42. †† For 8 months, 54. ‡‡ For 9 months, 47. §§ For 11 months, 51.

a, b, c. In the columns from January to December, inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

a For 92 observations. b For 91 observations. c For 90 observations. d For 89 observations.
e For 88 observations. f For 87 observations. g For 86 observations. h For 85 observations.
i For 84 observations. j For 83 observations. k For 81 observations. l For 79 observations.
m For 78 observations. n For 77 observations. o For 76 observations. p For 75 observations.
q For 73 observations. r For 72 observations. s For 70 observations. t For 68 observations.
u For 66 observations. v For 60 observations. w For 55 observations.

SEPT.—Sunny, 3, 4, 7, 8, 10, 14, 16, 17, 18, 19, 20, 22, 23, 28—14 days. Cloudy, 1, 2, 5, 6, 9, 11, 12, 13, 15, 21, 24, 25, 26, 27, 29, 30—16 days.

OCT.—Sunny, 18, 19, 22, 25, 27, 28, 30, 31—8 days. Cloudy, 17, 20, 21, 23, 24, 26, 29—7 days. No record for the rest of the month.

NOV.—Sunny, 1, 2, 3, 4, 5, 6, 7, 8, 11, 12, 17, 18, 30—13 days. Cloudy, 9, 10, 13, 14, 15, 16, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29—17 days.

DEC.—Sunny, 1, 5, 6, 9, 29—5 days. Cloudy, 2, 3, 4, 7, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 30, 31—26 days.

ESCANABA.

JAN.—Sunny, 1, 2, 6, 7, 8, 10, 12, 17, 25, 26, 27, 29, 30, 31—14 days. Cloudy, 4, 5, 9, 11, 13, 15, 16, 19, 20, 21, 22, 23—12 days. Partly cloudy, 3, 14, 18, 24, 28—5 days.

FEB.—Sunny, 12, 21, 22, 24, 27, 28—6 days. Cloudy, 5, 6, 7, 10, 14, 15, 17, 18, 23, 25, 26—11 days. Partly cloudy, 1, 2, 3, 4, 8, 9, 11, 13, 16, 19, 20—11 days.

MARCH.—Sunny, 3, 4, 7, 12, 14, 16, 17, 18, 19, 20, 22, 23, 24, 25, 26, 28, 29, 30—18 days. Cloudy, 1, 2, 5, 6, 8, 9, 10, 11, 13, 15, 21, 27, 31—13 days.

APRIL.—Sunny, 5, 7, 8, 9, 17, 18, 19, 21, 29—9 days. Cloudy, 2, 3, 4, 6, 11, 12, 13, 14, 15, 22, 23, 24, 25, 26, 27, 28, 30—17 days. Partly cloudy, 1, 10, 16, 20—4 days.

MAY.—Sunny, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 26, 27, 28, 31—20 days. Cloudy, 1, 2, 3, 4, 5, 22, 23, 24, 25, 29, 30—11 days.

JUNE.—Sunny, 3, 9, 10, 19, 24, 25, 26, 27, 28, 29—10 days. Cloudy, 1, 2, 4, 5, 6, 7, 8, 11, 12, 13, 14, 15, 16, 17, 18, 20, 21, 22, 23, 30—20 days.

JULY.—Sunny, 6, 7, 8, 9, 10, 13, 15, 18, 19, 21, 22, 23, 24, 30, 31—15 days. Cloudy, 1, 2, 3, 11, 12, 14, 16, 17, 20, 25, 26, 27, 28, 29—14 days. Partly cloudy, 4, 5—2 days.

AUG.—Sunny, 1, 4, 5, 6, 7, 9, 11, 12, 16, 17, 18, 20, 21, 23, 25, 27, 28, 29, 30—19 days. Cloudy, 2, 3, 8, 10, 13, 14, 15, 19, 22, 24, 26, 31—12 days.

SEPT.—Clear, 2, 3, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 22, 23, 24, 25, 27, 28, 29, 30—25 days. Cloudy, 1, 4, 6, 20, 26—5 days.

OCT.—Sunny, 13, 14, 15, 18, 22, 24, 25, 27, 29, 31—10 days. Cloudy, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 16, 17, 19, 20, 21, 23, 26, 28, 30—21 days.

NOV.—Sunny, 1, 2, 4, 5, 6, 7, 8, 11, 12, 13, 15, 17, 20, 23, 26, 27, 28, 29—18 days. Cloudy, 3, 9, 10, 14, 16, 18, 19, 21, 22, 24, 25, 30—12 days.

DEC.—Cloudy, 1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14, 17, 18, 19, 20, 21, 23, 24, 25, 27, 31—23 days. No record for the rest of the month.

MACKINAW CITY.

JAN.—Clear, 1, 7, 8, 15, 24—5 days. Fair, 6, 10, 12, 14, 17, 18, 19, 20, 25, 26, 27, 28, 29, 30, 31—15 days. Cloudy, 2, 3, 4, 5, 9, 11, 13, 16, 21, 22, 23—11 days.

FEB.—Clear, 4, 12, 15, 20, 24, 25—6 days. Fair, 1, 3, 9, 11, 13, 16, 17, 19, 22, 27, 28—11 days. Cloudy, 2, 5, 6, 7, 8, 10, 14, 18, 21, 23, 26—11 days,

MARCH.—Clear, 3, 4, 10, 14, 19, 20, 25, 26, 29, 30—10 days. Fair, 1, 2, 7, 8, 9, 12, 15, 16, 18, 22, 23, 24, 27, 28, 31—15 days. Cloudy, 5, 6, 11, 13, 17, 21—6 days.

APRIL.—Clear, 1, 2, 8, 10, 17, 18, 21, 26, 27—9 days. Fair 5, 6, 7, 9, 16, 19, 20, 24, 25, 29—10 days. Cloudy, 3, 4, 11, 12, 13, 14, 15, 22, 23, 28, 30—11 days.

MAY.—Clear, 1, 6, 7, 8, 9, 10, 11, 12, 13, 14, 17, 18, 19, 20, 28—15 days. Fair, 2, 3, 4, 15, 16, 21, 22, 23, 24, 26, 27, 29, 31—13 days. Cloudy, 5, 25, 30—3 days.

JUNE.—Clear, 3, 7, 10, 26, 27, 28—6 days. Fair, 4, 6, 8, 9, 11, 13, 14, 15, 19, 20, 25, 29—12 days. Cloudy, 1, 2, 5, 12, 16, 17, 18, 21, 22, 23, 24, 30—12 days.

JULY.—Clear, 7, 8, 10, 11, 13, 19, 22, 23, 24, 25, 26, 29, 31—13 days. Fair, 1, 2, 5, 6, 9, 12, 14, 15, 16, 18, 20, 27, 30—13 days. Cloudy, 3, 4, 17, 21, 28—5 days.

AUG.—Clear, 4, 6, 8, 9, 12, 16, 18, 20, 21, 24, 28, 29, 30—13 days. Fair, 1, 2, 3, 5, 7, 11, 13, 15, 17, 19, 25, 26, 27, 31—14 days. Cloudy, 10, 14, 22, 23—4 days.

SEPT.—Clear, 2, 3, 4, 8, 10, 14, 15, 16, 17, 18, 19, 28—12 days. Fair, 5, 6, 9, 11, 12, 13, 20, 21, 23, 25, 26, 27, 29, 30—14 days. Cloudy, 1, 7, 22, 24—4 days.

OCT.—Clear, 14, 15, 18, 27, 31—5 days. Fair, 1, 2, 6, 10, 13, 17, 19, 22, 29, 30—10 days. Cloudy, 3, 4, 5, 7, 8, 9, 11, 12, 16, 20, 21, 23, 24, 25, 26, 28—16 days.

NOV.—Clear, 1, 5, 6, 7, 8, 11, 12—7 days. Fair, 2, 4, 18, 21, 23, 29, 30—7 days. Cloudy, 3, 9, 10, 13, 14, 15, 16, 17, 19, 20, 22, 24, 25, 26, 27, 28—16 days.

DEC.—Fair, 5, 6, 9, 15, 16, 29—6 days. Cloudy, 1, 2, 3, 4, 7, 8, 10, 11, 12, 13, 14, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 30, 31—25 days.

ALPENA.

Jan.—Sunny, 7, 15, 18, 24, 26, 27, 30—7 days. Cloudy, 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14, 16, 17, 19, 20, 21, 22, 23, 25, 28, 29, 31—24 days.

Feb.—Sunny, 4, 9, 13, 22, 24, 25—6 days. Cloudy, 1, 2, 3, 5, 6, 7, 8, 10, 11, 12, 14, 15, 16, 17, 18, 19, 20, 21, 23, 26, 27, 28—22 days.

March.—Sunny, 1, 2, 3, 4, 7, 8, 10, 12, 14, 15, 19, 20, 23, 25, 26, 28, 29, 30, 31—19 days. Cloudy, 5, 6, 9, 11, 13, 16, 17, 18, 21, 22, 24, 27—12 days.

April.—Sunny, 1, 5, 6, 7, 10, 16, 17, 18, 19, 21, 23, 26, 27, 29—14 days. Cloudy, 2, 3, 4, 8, 9, 11, 12, 13, 14, 15, 20, 22, 24, 25, 28, 30—16 days.

May.—Sunny, 1, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19, 20, 21, 26, 27, 28, 29—22 days. Cloudy, 2, 5, 17, 22, 23, 24, 25, 30, 31—9 days.

June.—Sunny, 3, 6, 7, 9, 10, 11, 14, 18, 19, 20, 22, 25, 26, 27, 28, 29—16 days. Cloudy, 1, 2, 4, 5, 8, 12, 13, 15, 16, 17, 21, 23, 24, 30—14 days.

July.—Sunny, 6, 7, 8, 10, 11, 12, 13, 15, 16, 18, 19, 23, 24, 25, 26, 27, 28, 29, 30, 31—20 days. Cloudy, 1, 2, 3, 4, 5, 9, 14, 17, 20, 21, 22—11 days.

Aug.—Sunny, 1, 2, 4, 5, 6, 7, 8, 9, 11, 12, 16, 18, 19, 20, 21, 24, 26, 27, 28, 29, 30, 31—22 days. Cloudy, 3, 10, 13, 14, 15, 17, 22, 23, 25—9 days.

Sept.—Sunny, 2, 3, 4, 7, 8, 10, 11, 14, 15, 16, 17, 18, 19, 20, 25, 26, 28, 29, 30—19 days. Cloudy, 1, 5, 6, 9, 12, 13, 21, 22, 23, 24, 27—11 days.

Oct.—Sunny, 2, 8, 13, 14, 15, 18, 19, 22, 25, 27, 31—11 days. Cloudy, 1, 3, 4, 5, 6, 7, 9, 10, 11, 12, 16, 17, 20, 21, 23, 24, 26, 28, 29, 30—20 days.

Nov.—Sunny, 1, 2, 6, 7, 8, 11, 12, 17, 18, 28—10 days. Cloudy, 3, 4, 5, 9, 10, 13, 14, 15, 16, 19, 20, 21, 22, 23, 24, 25, 26, 27, 29, 30—20 days.

Dec.—Sunny, 6, 9, 15, 16, 29—5 days. Cloudy, 1, 2, 3, 4, 5, 7, 8, 10, 11, 12, 13, 14, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 30, 31—26 days.

THORNVILLE.

Jan.—Sunny, 2, 5, 7, 18, 21, 24, 26, 27, 29—9 days. Cloudy, 1, 4, 8, 9, 10, 12, 13, 14, 15, 16, 17, 19, 20, 22, 23, 25, 28, 31—18 days. No record for the rest of the month.

Feb.—Sunny, 4, 9, 13, 16, 24, 25, 27—7 days. Cloudy, 1, 2, 3, 5, 6, 7, 8, 11, 15, 18, 19, 20, 21, 22, 26—15 days. No record for the rest of the month.

March.—Sunny, 1, 4, 7, 8, 16, 20, 23, 25, 29, 30, 31—11 days. Cloudy, 3, 5, 6, 12, 13, 17, 21, 22, 27—9 days, No record for the rest of the month.

April.—Sunny, 1, 2, 3, 7, 8, 9, 10, 11, 12, 13, 14, 17, 19, 21, 25—15 days. Cloudy, 4, 22, 23, 24, 26, 28—6 days. No record for the rest of the month.

May.—Sunny, 1, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19, 20, 21, 22, 28, 29—21 days. Cloudy, 5, 17, 26, 30, 31—5 days. No record for the rest of the month.

June.—Sunny, 3, 4, 10, 11, 12, 13, 14, 15, 16, 17, 19, 20, 21, 22, 25, 26, 27, 28, 29—19 days. Cloudy, 1, 2, 5, 6, 8, 23—6 days. No record for the rest of the month.

July.—Sunny, 1, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15, 16, 17, 19, 20, 23, 24, 25, 26, 27, 28, 29, 31—23 days. Cloudy, 3, 18, 21—3 days. No record for the rest of the month.

Aug.—Sunny, 1, 2, 3, 4, 5, 6, 7, 8, 13, 16, 18, 19, 20, 24, 26, 27, 28, 30, 31—18 days. Cloudy, 14, 15, 17, 21, 22, 23—6 days. No record for the rest of the month.

Sept.—Sunny, 3, 4, 5, 7, 8, 10, 13, 14, 15, 16, 17, 18, 19, 20, 25, 28—16 days. Cloudy, 1, 6, 9, 21, 24, 27, 29, 30—8 days. No record for the rest of the month.

Oct.—Sunny, 8, 13, 14, 15, 16, 18, 19, 22, 25, 26, 27, 30, 31—13 days. Cloudy, 1, 2, 3, 4, 5, 9, 10, 11, 17, 23, 29—11 days. No record for the rest of the month.

Nov.—Sunny, 1, 2, 4, 5, 6, 7, 8, 11, 12, 13, 17, 18, 29—13 days. Cloudy, 10, 15, 16, 19, 20, 22, 23, 24, 25, 26, 27, 28, 30—13 days. No record for the rest of the month.

Dec.—Sunny, 1, 5, 6, 9, 29, 30—6 days. Cloudy, 2, 3, 4, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23 24, 25, 27, 28, 31—23 days. No record for the rest of the month.

SWARTZ CREEK.

Jan.—Sunny, 2, 3, 7, 18, 24, 26, 27, 29—8 days. Fair, 1, 10, 30—3 days. Cloudy, 4, 5, 6, 8, 9, 11, 12, 13, 14, 15, 16, 17, 19, 20, 21, 22, 23, 25, 28, 31—20 days.

Feb.—Sunny, 4, 9, 13, 16—4 days. Fair, 24, 28—2 days. Cloudy, 1, 2, 3, 5, 6, 7, 8, 10, 11, 12, 14, 15, 17, 18, 19, 20, 21, 22, 23, 25, 26, 27—22 days.

March.—Sunny, 1, 2, 4, 7, 8, 15, 19, 20, 23, 25, 26, 29, 30, 31—14 days. Fair, 9, 11, 12, 14, 16, 28—6 days. Cloudy, 3, 5, 6, 10, 13, 17, 18, 21, 22, 24, 27—11 days.

APRIL.—Sunny, 1, 2, 3, 5, 7, 8, 9, 10, 12, 13, 16, 17, 19, 21, 24, 25, 26, 27, 30—19 days. Fair, 14, 15, 29—3 days. Cloudy, 4, 6, 11, 18, 20, 22, 23, 28—8 days.

MAY.—Sunny, 1, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 18, 19, 20, 21, 22, 28, 29—20 days. Fair, 2, 16, 27—3 days. Cloudy, 5, 17, 23, 24, 25, 26, 30, 31—8 days.

JUNE.—Sunny, 3, 4, 7, 8, 10, 11, 12, 13, 14, 16, 17, 18 19, 20, 21, 22, 24, 25, 26, 27, 28, 29, 30—23 days. Fair, 5, 15—2 days. Cloudy, 1, 2, 6, 9, 23—5 days.

JULY.—Sunny, 1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31—29 days. Cloudy, 4, 18—2 days.

AUG.—Sunny, 1, 2, 3, 5, 6, 7, 8, 9, 10, 12, 17, 18, 19, 20, 24, 27, 28, 29, 30, 31—20 days. Fair, 4, 13, 16, 21, 25, 26—6 days. Cloudy, 11, 14, 15, 22, 23—5 days.

ANN ARBOR.

JAN.—Sunny, 1, 3, 5, 7, 10, 18, 26, 29—8 days. Cloudy, 4, 8, 9, 11, 12, 13, 14, 15, 16, 17, 19, 20, 22, 23, 25, 27, 28, 31—18 days. No record for the rest of the month.

FEB.—Sunny, 9, 13, 16, 24—4 days. Cloudy, 1, 2, 3, 5, 6, 7, 8, 10, 11, 12, 14, 15, 17, 18, 19, 20, 21, 22, 23, 26, 27, 28—22 days. No record for the rest of the month.

MARCH.—Sunny, 1, 2, 4, 7, 14, 16, 20, 23, 25, 26, 30—11 days. Cloudy, 5, 6, 10, 11, 13, 17, 18, 21, 22, 24, 27, 28—12 days. No record for the rest of the month.

APRIL —Sunny, 1, 3, 5, 7, 8, 9, 10, 12, 19, 21—10 days. Cloudy, 2, 4, 16, 18, 20, 22, 23, 24, 28, 29—10 days. No record for the rest of the month.

MAY.—Sunny, 10 11, 12, 13, 14, 15, 18, 19, 20, 21, 22, 28, 29—13 days. Cloudy, 1, 4, 7, 8, 9, 16, 17, 23, 24, 26, 27, 30, 31—13 days. No record for the rest of the month.

JUNE.—Sunny, 10, 11, 12, 13, 14, 18, 19, 25, 26, 27, 28, 29—12 days. Cloudy, 1, 2, 5, 6, 8, 9, 22, 23—8 days. No record for the rest of the month.

JULY.—Sunny, 26, 27, 28, 29, 30, 31—6 days. Cloudy, 5—1 day. Record not kept for the rest of the month.

AUG.—Sunny, 1, 2, 4, 6, 7, 18, 19, 29, 30, 31—10 days. Cloudy, 3, 5, 13, 14, 15, 16, 17, 21, 22, 23, 26, 27—12 days. No record for the rest of the month.

SEPT --Sunny, 3, 4, 8, 16, 17, 18, 19, 20—8 days, Cloudy, 1, 2, 6, 9, 10, 11, 12, 13, 21, 22, 24, 26, 27. 28, 29, 30—16 days. No record for the rest of the month.

OCT.—Sunny, 15, 16, 18, 19, 22, 25, 26, 27, 30, 31—10 days. Cloudy, 1, 2, 3. 4, 5, 6, 8, 9, 10, 11, 20, 21, 23, 24, 28, 29—16 days. No record for the rest of the month.

NOV.—Sunny, 1, 2, 4, 5, 6, 7, 8, 11, 12, 18, 30—11 days. Cloudy, 9, 10, 13, 14, 15, 16, 20, 22, 23, 24, 25, 26, 27, 28, 29—15 days. No record for the rest of the month.

DEC.—Sunny, 5, 6, 14, 25, 29—5 days. Cloudy, 1, 2, 3, 4, 7, 8, 9. 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 26, 27, 28, 30, 31—26 days.

KALAMAZOO.

JAN.—Sunny, 1, 3, 7, 24, 27, 29—6 days. Cloudy, 2, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 25, 26, 28, 30, 31—25 days.

FEB.—Sunny, 9, 13, 16, 24—4 days. Cloudy, 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 14, 15, 17. 18, 19, 20, 21, 22, 23, 25, 26, 27, 28—24 days.

MARCH.—Sunny, 1, 2, 4, 7, 8, 10, 12, 15, 16, 19, 20, 23, 25, 26, 28, 30, 31—17 days. Cloudy, 3, 5, 6, 9, 11, 13, 14, 17, 18, 21, 22, 24, 27, 29—14 days.

APRIL.—Sunny, 2, 5, 7, 8, 9, 10, 11, 12, 13, 16, 19, 21, 26, 27, 28, 29—16 days. Cloudy, 1, 3, 4, 6, 14, 15, 17, 18, 0, 22, 23, 24, 25, 30—14 days.

MAY.—Sunny, 1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19, 20, 21, 22, 26, 28, 29—23 days. Cloudy, 5, 17, 23, 24, 25, 27, 30, 31—8 days.

JUNE.—Sunny, 3, 4, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 21, 22, 24, 25, 26, 27, 28, 29—21 days. Cloudy, 1, 2, 5, 6, 14. 19, 20, 23, 30—9 days.

JULY.—Sunny, 5, 6, 7, 8, 10, 11, 12, 15, 16, 17, 18, 19, 20. 22, 23, 24, 25, 26, 27, 28, 29, 30, 31—23 days. Cloudy, 1, 2, 3, 4, 9, 13, 14, 21—8 days.

AUG.—Sunny, 1, 2, 3, 4, 5, 6, 7, 8, 9, 12, 18, 19, 25, 27, 29, 30, 31—17 days. Cloudy, 10, 11, 13, 14, 15, 16, 17, 20, 21, 22, 23, 24, 26, 28—14 days.

SEPT.—Sunny, 3, 4, 7, 8, 13, 14, 15, 16, 17, 18, 19, 20, 21, 23—14 days. Cloudy, 1, 2, 5, 6, 9, 10, 11, 12, 22, 24, 25, 26, 27, 28, 29, 30—16 days.

OCT.—Sunny, 3, 7, 12, 13. 14, 15, 16, 18, 19, 22, 25, 26, 27, 30, 31—15 days. Cloudy, 1, 2, 4, 5, 6, 8, 9. 10, 11, 17, 20, 21, 23, 24, 28, 29—16 days.

NOV.—Sunny, 1, 2, 3, 4, 5, 6, 8, 11, 12, 17, 30—11 days. Cloudy, 7, 9, 10, 13, 14, 15, 16, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29—19 days.

DEC.—Sunny, 1, 5, 6, 13, 14, 24, 29—7 days. Cloudy, 2, 3, 4, 7, 8, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 21, 22, 23, 25, 26, 27, 28, 30, 31—24 days.

BATTLE CREEK.

SEPT.—Sunny, 3, 4, 7, 8, 16, 17, 18, 19, 20, 23—10 days. Cloudy, 2, 9, 11, 12, 21, 26, 27, 30—8 days. No record for the rest of the month.

OCT.—Sunny, 13, 14, 15, 18, 19, 25, 26, 27, 31—9 days. Cloudy, 1, 2, 4, 5, 6, 8, 9, 20, 23, 24, 28—11 days. No record for the rest of the month.

NOV.—Sunny, 1, 2, 4, 5, 6, 7, 12, 18—8 days. Cloudy, 9, 14, 15, 19, 20, 23, 24, 25, 26, 27—10 days. No record for the rest of the month.

DEC.—Sunny, 5, 6—2 days. Cloudy, 2, 3, 4, 10, 12, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 30, 31—21 days. No record for the rest of the month.

GULLIVER LAKE.

JAN.—Hours of sunshine, 130½.

FEB.—Clear, 10; fair, 6; cloudy, 12; rainy, 9; hours of sunshine, 132½.

MAR.—Clear, 17; fair, 4; cloudy, 10; rainy, 3; hours sunshine, 215.

APRIL.—Clear, 14; fair, 6; cloudy, 10; rainy, 10; hours sunshine, 211½.

MAY.—Clear, 19; fair, 10; cloudy, 2; rainy 7; hours sunshine, 332.

JULY.—Clear, 16; fair, 8; cloudy 7; rainy, 8; hours sunshine, 295.

AUG.—Clear, 18; fair, 7; cloudy, 6; rainy, 6; hours sunshine, 283½.

SEPT.—Clear, 13; fair, 11; cloudy 6; rainy, 8; hours sunshine, 232½.

OCT.—Clear, 7, fair, 5; cloudy 19; rainy, 14; hours sunshine, 117.

NOV.—Clear, 8; fair, 4; cloudy, 18; rainy, 6; hours sunshine, 116.

DEC.—Clear, 1; fair, 4; cloudy, 26; rainy, 13; hours sunshine, 29½; has less sunshine than any month since record has been kept.

EXHIBIT 21.—*Dates of Solar and Lunar Halos,*

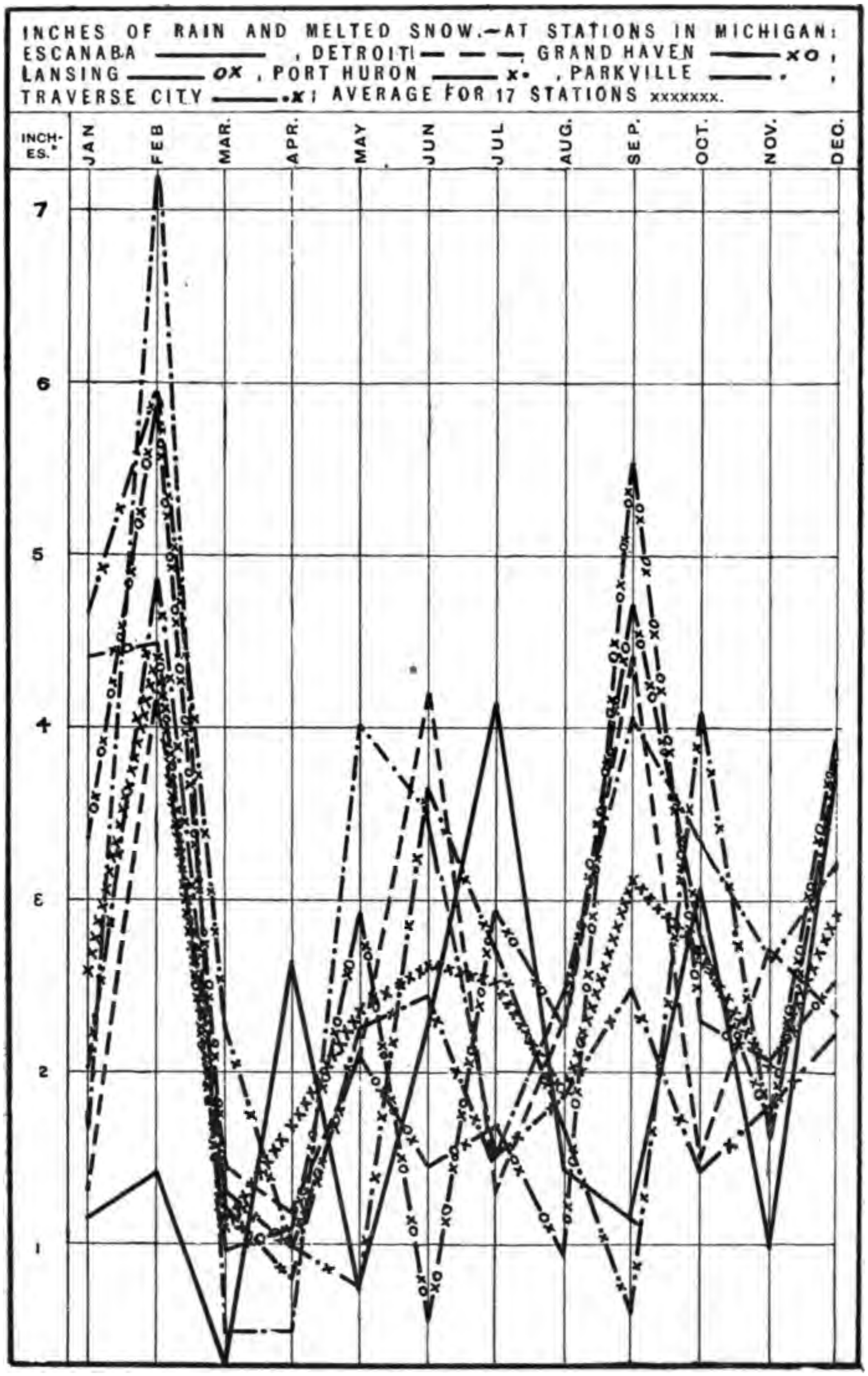
Line Number.	Stations.	Dates of Halos Recorded,									
		January.		February.		March.		April.		May.	
		Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.
1	Ripley	8,10,23	11,24	20,21				5,27	2	23	
2	Marquette	19,21	9,10,13			16,19,27	4			4,22	5
3	Gulliver Lake	17		21	6,12	15		6	2,5		
4	Escanaba	9,18	3,7,9	11,20	6	8,14,21	4,9	1,5,6,7,16	5,7	4,22	5
5	Mackinaw C'ty		7,9	22	4,9	10	8	27	5,6,7,8,27		5
6	Alpena		4,7				9				
7	Grand Haven		7,8,29	25			3,4				
8	Port Huron					4,9,20	3,4,8				
9						21,26					
10	Lansing	11,20,29	2,3,19	1,10,25	4	4,7,14,24	4,7,9		3,17		4
11	Thornville						2,3				
12	Swartz Cre'k	6,11,13	3,4,8,29	4,9,11,25	3,4,9	3,4,8,9	3,4,8	6,8,11	5,7,27		
13		27,29,30				14		17,27			
14	Kalamazoo.		8,18	25		3,20,25	3,10	28	1,2,3,4,7		4
15						26			8,10		
16	Birmingham		3,10						27	4	2,3
17	Hudson										

Recorded on the Monthly Registers in 1887.

Months, 1887.														
June.		July.		August.		September.		October.		November.		December.		Line Number.
Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	
...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
...	...	...	...	...	...	...	...	...	...	8,12	21	...	...	2
...	...	...	...	...	...	...	...	...	...	...	...	...	...	3
10,11,18,29	...	...	...	...	...	...	...	...	...	...	...	...	22	4
...	...	...	...	...	...	...	...	...	...	...	...	...	...	5
...	...	14	3	...	...	...	...	...	...	...	...	...	...	6
...	...	...	...	...	...	...	...	...	...	16,18,22,23	...	...	1,6,19	7
...	...	...	...	...	...	...	...	...	...	...	...	...	...	8
...	...	...	...	...	...	...	...	...	...	...	...	...	...	9
12	29	...	...	9,13	*	5,10,20,26	...	16,22	...	13,18	28	19,30	1,19	10
...	...	...	...	...	...	...	...	...	...	...	...	...	...	11
30	...	...	...	...	9	...	...	...	...	...	...	...	...	12
...	...	...	...	...	...	...	...	...	...	...	...	...	...	13
...	28,29,30	...	1,28	...	27	...	*	...	...	...	...	...	...	14
...	...	...	...	...	...	...	...	...	...	...	...	...	...	15
...	...	...	...	...	...	...	...	...	22	...	...	...	...	16
...	...	...	...	...	...	...	...	...	...	...	...	...	1	17

* Lunar Coronae.

DIAGRAM VII.—RAINFALL, BY MONTHS IN 1887.



*Scale, 1 In. Rainfall to .92 In. Vertically.

H. B. T. Del. Des. by H. B. B.

TABLE VII.—*Inches of Rain and Melted Snow for the Year, and for each Month of the Year 1887, at 17 Stations in Michigan,—as compiled from Daily Observations made by Observers* for the State Board of Health, and for the U. S. Signal Service.*

Stations in Michigan.* (Those of the U. S. Signal Service in Italics.)	Divisions of the State.†	Inches of Rain and Melted Snow.													
		Year.		Months, 1887.											
		Norm. ‡	1887.	Jan.	Feb.	Mar.	Apr.	May.	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 17 stations.§..	....	......	29.82	2.57	4.40	1.08	1.69	2.35	2.62	2.51	1.86	3.12	2.69	2.00	2.92
Marquette.............	U. P.	27.45^{2}	25.62	1.96	1.36	0.31	3.44	1.04	3.15	2.62	2.90	1.06	2.43	3.03	2.32
Gulliver Lake.	U. P.	......	31.00	1.69	3.44	0.47	5.22	1.74	1.81	4.23	1.69	2.81	3.78	0.90	3 22
Escanaba........	U. P.	34.58^{16}	23.01	1.15	1.41	0.31	2.65	0.73	2.27	4.14	1.44	1.13	3.07	0.98	3.73
Traverse City.........	N. W.	40.87^{6}	32.76	4.66	5.94	2.27	0.98	0.74	3.65	2.70	1.66	0.61	4.09	1.62	3.84
Mackinaw City.......	N.	26.76^{4}	15.08	0.86	1.87	0.22	1.46	1.49	1.11	2.38	0.28	1.65	1.59	1.09	1.08
Alpena.................	N. E.	37.86^{15}	37.88	5.02	4.60	1.22	2.66	2.63	2.20	5.16	1.09	2.14	3.88	2.71	4.57
Harrisville...........	N. E.	......	33.61	4.50	4.30	1.05	2.13	3.17	2.52	4.98	2.35	1.34	4.27	1.77	1.23
Grand Haven.........	W.	39.81^{12}	32.75	4.40	4.48	0.95	1.09	2.91	0.55	2.94	2.26	4.71	2.78	1.72	3.96
Port Huron...........	B. & E.	33.37^{13}	24.82	2.03	4.86	1.20	0.80	2.24	2.44	1.47	1.87	2.48	1.42	1.79	2.22
Thornville............	B. & E.	34.43^{11}	31.66	2.17	3.36	1.85	1.46	4.30	2.57	1.75	3.12	3.74	2.01	2.24	3.09
Agr'l College.........	C.	32.22^{24}	31.10	3.25	5.71	1.78	0.90	2.42	2.47	1.50	0.89	4.72	1.86	2 28	3.32
Lansing, S. B. of H...	C.	36.68^{8}	30.08	3.36	5.87	1.30	0.98	2.12	1.45	1.68	0.93	5.53	2.28	2.06	2.52
Swartz Creek.........	C.	......	||	2.62	5.49	1.64	1.56	1.71	2.05	2.02	2.79	5.11	.....	.....	.....
Ann Arbor.............	S. C.	......	¶	.....	5.87	1.52	1.21	1.95	3.21	1.33	1.56	3.93	1.98	2.08	2.76
Battle Creek..........	S. C.	......	**	.....	.....	.....	.....	1.72	4.18	1.74	1.16	1.09	1.80	2.55	3.26
Hudson	S. C.	......	††	1.05	6.05	.....	1.58	2.84	4.99	3.10	2.34	4.28	2.86	2.99	2.15
Kalamazoo...........	S. C.	38.91^{11}	34.48	2.28	4.85	1.35	1.33	4.01	5.64	0.79	1.69	4.69	2.41	2.18	3.26
Marshall...............	S. C.	32.45^{9}	32.16	1.88	6.96	1.00	0.71	2.44	2.04	2.16	2.59	3.84	3.15	2.34	3.05
Parkville..............	S. C.	42.92^{3}	34.60	1.68	7.19	0.49	0.49	4.00	3.50	1.50	2.51	4.03	3.33	2.67	3.21
Birmingham..........	S. E.	......	27.35	1.54	4.50	1.23	1.28	1.85	2.91	1.29	2.08	4.22	1.83	1.90	2.72
Detroit................	S. E.	34.09^{16}	28.97	1.31	4.16	1.44	1.19	2.11	4.19	1.31	2.30	4.41	1.49	2.72	2.34

---

* The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1, page 2.

† The names of divisions and the counties in each are stated in Exhibit I., in a paper which follows, on weekly reports of diseases.

‡ Numbers in this column state the average annual rainfall for periods of years ending in each case with Dec. 31, 1886. The small figures above and at the right of numbers which state the rainfall, denote the number of years included in the average.

§ This line is an average for only the stations from which statements, nearly complete, are given for every month of the year. It does not include Swartz Creek, Ann Arbor, Battle Creek, and Hudson.

|| The total rainfall for 9 months in 1887 is 24.99 inches. ¶ For 11 months, 27.40. ** For 8 months, 17.50. †† For 11 months, 34.23.

NOTE.—Computations of amount of rainfall were furnished by the observers at Escanaba, May and July excepted; Mackinaw City, March and August excepted; Detroit, June excepted; Alpena, Grand Haven, Port Huron, Ann Arbor, and Marquette, for the year. All other computations in Table VII. were made in the office of the Secretary of the State Board of Health.

The lines for 7 representative stations in Table VII. are graphically represented in Diagram VII., page 50.

EXHIBIT 22.—*Inches of Rain and Melted Snow by Years and Months, in 1887, compared with Annual and Monthly Average for 1886, and for the ten Years, 1877–86. These averages are for Groups of Several Stations in Michigan.**

Years, Etc.	Inches of Rain and Melted Snow.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 10 years, 1877-86*	37.18	2.13	2.54	2.53	2.65	3.41	4.22	3.61	3.58	3.57	3.62	3.23	2.76
1886 (18 stations) *..	32.16	3.05	1.72	2.74	2.40	2.58	2.29	1.36	4.21	5.36	1.97	2.35	2.13
1887 (17 stations)....	29.82	2.57	4.40	1.08	1.69	2.35	2.62	2.51	1.86	3.12	2.69	2.00	2.92
In 1887 **Greater** than Average for 10 years, 1877-86....	.....	0.44	1.86	......	......	......	......	......	......	......	......	......	0.16
In 1887 **Less** than Average for 10 yrs, 1877-86..............	7.36	......	......	1.45	0.96	1.06	1.60	1.10	1.72	0.45	0.93	1.23	......
In 1887 **Greater** than in 1886........	......	......	2.68	......	......	......	0.33	1.15	......	......	0.72	......	0.79
In 1887 **Less** than in 1886...............	2.34	0.48	......	1.66	0.71	0.23	......	......	2.35	2.24	......	0.35	......

*Thornville, Kalamazoo, Detroit for 1877–86; Mendon for 1877–8 and 1880–2; Tecumseh for 1877–8 and 1880-5; Niles for 1878–81; Nirvana, Coldwater, Woodmere Cemetery (near Detroit) for 1877–9; Agricultural College for 1877–86; Otisville for 1878-80 and 1882; Marquette for 1879–84 and 1886; Alpena, Grand Haven, Port Huron, 1879–86; Battle Creek for 1877–8 and 1884; Benton Harbor 1877–8; Escanaba, Lansing for 1880–6; Washington for 1880–3; Fife Lake, Ypsilanti for 1877; Harrisville for 1881–2 and 1886; Reed City for 1881-5; Winfield for 1881–3; Ann Arbor for 1881–2 and 1885–6; Marshall for 1881–4 and 1886; Hudson and Mallory Lake for 1881 and 1886; Traverse City for 1882–6; Hastings for 1882; Hillsdale for 1882–4; Parkville for 1882–3 and 1885–6; Ionia for 1883–4; Manistique, Swartz Creek for 1884-5; Mackinaw City for 1884–6; Pentwater, East Saginaw for 1886.

EXHIBIT 23.—*Comparison of the Rainfall during the Year and during each month of the Year 1887, with that for the Year 1886; and with the Average for the 23 Years, 1864–86. Observations made by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Michigan.*

Years, Etc.	Inches of Rain and Melted Snow.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 23 years, 1864–86.	32.27	1.79	1.95	2.59	2.47	3.11	4.26	3.46	2.89	3.03	2.62	2.22	1.90
1886..................	27.95	2.66	1.35	2.63	1.99	2.67	1.92	0.65	4.69	5.40	0.95	1.48	1.56
1887..................	31.10	3.25	5.71	1.78	0.90	2.42	2.47	1.50	0.89	4.72	1.86	2.28	3.32
In 1887 **Greater** than av. for 23 yrs. 1864–86..............	......	1.46	3.76	......	......	......	......	......	......	1.69	......	0.06	1.42
In 1887 **Less** than av. for 23 yrs. 1864–86..............	1.17	......	......	0.81	1.57	0.69	1.79	1.96	2.00	......	0.76	......	......
In 1887 **Greater** than in 1886...... ..	3.15	0.59	4.36	......	......	......	0.55	0.85	......	......	0.91	0.80	1.76
In 1887 **Less** than in 1886................	......	......	......	1.85	1.09	0.25	......	......	3.80	0.68	......	......	......

EXHIBIT 24.—*Average Amount of Atmospheric Ozone (Day) by Year and Months, in 1887, compared with Annual and Monthly Average for 1886, and for the ten years 1877-1886. These Averages are for Groups of Several Stations in Michigan.**

Years, Etc.	Ozone by Day.—Degree of Coloration of Test Paper.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July,	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 10 y'rs—1877-86*..	3.06	3.33	3.46	3.44	3.21	3.09	2.88	2.69	2.88	2.74	2.78	3.01	3.18
1886 (10 stations)*....	2.99	2.87	2.92	2.89	2.89	2.91	2.89	2.51	3.04	2.94	3.14	3.30	3.54
1887 (11 stations).....	3.20	3.19	3.29	3.54	3.34	3.20	3.01	2.85	3.04	3.13	3.29	3.15	3.39
In 1887 **Greater** than Av. for 10 years, 1877-86......	0.14	......	......	0.10	0.13	0.11	0.13	0.16	0.16	0.39	0.51	0.14	0.21
In 1887 **Less** than Av. for 10 years, 1877-86......	......	0.14	0.17	......	......	......	......	......	......	......	......	......	......
In 1887 **Greater** than in 1886........	0.21	0.32	0.37	0.65	0.45	0.29	0.12	0.34	0	0.19	0.15	......	......
In 1887 **Less** than in 1886................	......	......	......	......	......	......	......	......	......	......	......	0.15	0.15

* Thornville, Kalamazoo for 1877-86; Mendon for 1877-83; Tecumseh for 1877-85; Battle Creek for 1877-80 and 1882-4; Niles for 1878-81; Nirvana for 1877-9: Coldwater, Agricultural College for 1877-8 and 1880; Otisville for 1878-80 and 1882; Alpena. Lansing for 1879-86; Washington for 1879-83; Petoskey and Woodmere Cemetery (near Detroit) for 1878-9; Marquette for 1880-1, 1883-4 and 1886; Grand Haven for 1880-4; Ann Arbor for 1880-86; Fife Lake, Ypsilanti for 1877; Ionia for 1880, and 1883-4; Adrian for 1880; Hudson and Mallory Lake for 1881; Escanaba for 1881-5; Harrisville for 1881-2 and 1885-6; Reed City, Port Huron for 1881-5; Marshall for 1881-6; Traverse City for 1882-6; Hastings and Parkville for 1882; Hillsdale for 1882-4; Port Austin for 1883-5; Winfield for 1883; Manistique, Mackinaw City, Swartz Creek for 1884-5; Pentwater for 1886.

EXHIBIT 25.—*Average Amount of Atmospheric Ozone (Night) by Year and Months in 1887, compared with Annual and Monthly Average for 1886, and for the ten Years, 1877-1886. These Averages are for Groups of Several Stations in Michigan.**

Years, Etc.	Ozone by Night.—Degree of Coloration of Test Paper.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 10 years—1877-86.	3.23	3.91	4.04	4.07	3.56	3.31	2.98	2.55	2.49	2.54	2.99	3.35	3.55
1886 (10 stations)......	3.46	3.89	3 90	3.63	3.26	3.27	3.28	2.88	3.28	3.45	3.53	3.59	3.60
1887 (11 stations)......	3.42	3.81	4.21	3.53	3.55	3.34	3.22	2.92	3.02	3.16	3.39	3.31	3 62
In 1887, **Greater** than Av. for 10 yrs., 1877-86................	0.19	......	0.17	......	......	0.03	0.24	0.37	0.53	0.62	0.40	......	0.07
In 1887 **Less** than Av. for 10 years, 1877-86	......	0.10	......	0.54	0.01	......	......	......	......	......	......	0.04	......
In 1887 **Greater** than in 1886.........	......	......	0.31	......	0.29	0.07	......	0.04	......	......	......	......	0.02
In 1887 **Less** than in 1886................	0.04	0.08	......	0.10	......	......	0.06	......	0.26	0.29	0.14	0.28	......

* The stations represented in Exhibit 25 are the same as those represented in Exhibit 24, relative to day ozone, and named in foot note of that exhibit.

OBSERVATIONS FOR OZONE AT LANSING.

Since July 1, 1884, the observations for ozone at Lansing have been taken at the new shelter for meteorological instruments in the southwest part of the Capitol yard. Previous to July 1, 1884, the observations had been taken at the office window. Exhibit E, page 60, of the report for 1885, shows that the average for the month of July, 1884, is greater at each observation—7 A. M. to 2 P. M., 2 P. M. to 9 P. M., and 9 P. M to 7 A. M. at the shelter for instruments than at the office window. Possibly this fact should be taken into consideration in studying ozone at Lansing through a long period of years.

TABLE VIII.—*Relative Amount of Ozone in the Atmosphere, by Day, during the Year and during each Month of the Year 1887, at 11 Stations in Michigan,—as indicated by Averages of Observations made Daily by exposing Test-paper prepared according to Schönbein's formula, from 7 A. M. to 2 P. M.—Recorded according to a scale of 10 Degrees of Coloration of the Test-paper (greatest coloration by ozone equals 10) by observers for the State Board of Health, and for the U. S. Signal Service.**

Stations in Michigan.† *(Those of U. S. Signal Service in Italics.)	Divisions of the State.†	Degrees of Coloration of Test-paper—Day Observations.													
		Year.		Months, 1887.											
		Norm. ‡	1887.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 11 Stations §..	....	......	3.20	3.19	3.29	3.54	3.34	3.20	3.01	2.85	3.04	3.13	3.29	3.15	3.39
Marquette..............	U. P.	3.98^{2}	4.52	2.71	2.25	6.48	5.83	3.68	3.93	4.19	5.19	5.30	6.29	4.53	3.90
Escanaba..............	U. P.	......	2.09	^{f}3.50	2.43	2.80	2.70	2.20	2.80	2.30	1.45	1.50	1.16	1.03	1.16
Traverse City.........	N. W.	2.86^{6}	3.84	3.38	3.21	3.52	3.13	2.52	3.30	3.45	3.23	4.47	5.16	5.37	5.32
Mackinaw City.......	N.	......	‖	2.13	2.50	2.30	2.90	3.40	3.10	2.52	1.87	2.70	1.84	2.03	.....
Alpena................	N. E.	3.36^{9}	3.76	3.94	4.82	2.87	3.57	3.23	3.30	3.06	2.77	3.57	3.58	3.97	6.45
Harrisville	N. E.	4.40^{3}	4.31	4.42	4.93	4.10	4.33	4.65	4.20	4.32	4.35	4.07	3.68	4.17	4.45
Grand Haven.........	W.	......	¶	.....	2.30	1.90	2.30	4.40	3.77	3.50	5.30	4.40	5.10	3.50	3.80
Port Austin............	B. & E.	......	**	.....	.....	.....	.....	.....	^{d}2.67	1.97	1.97	^{b}2.14	3.23	^{b}3.72	^{a}3.90
Port Huron...........	B. & E.	......	††	2.26	2.07	1.58	2.07	1.84	1.60	1.39	2.65	.....	.....	.....	^{d}3.11
Thornville.............	B. & E.	2.65^{11}	2.55	3.29	3.46	2.97	2.67	2.42	1.80	1.77	2.10	2.23	2.42	2.33	3.10
Ionia	C.	......	‡‡	1.45	1.00	0.77	0.80	2.81	.....	.....	.....	.....	.....	^{c}0.57	^{a}0.50
Lansing, S. B. of H...	C.	3.23^{9}	2 89	2.81	3.29	3.26	3.10	3.39	3.07	3.06	3.23	2.23	2.90	2.13	2.26
Swartz Creek..........	C.	......	§§	3.06	3.84	3.56	3.83	3.11	2.62	1.82	2.90	3.03	.....	.....	.....
Ann Arbor.............	S. C.	2.69^{8}	3.45	3.39	3.96	4.00	3.90	4.10	^{b}3.69	^{a}2.93	3.26	3.57	2.97	3.23	2.45
Battle Creek..........	S. C.	......	‖‖	^{a}1.55	.....	2.55	2.00	2.55	2.27	2.52	2.35	2.17	2.10	2.20	1.65
Kalamazoo.............	S. C.	2.60^{11}	2.12	2.42	2 32	2.74	1.87	2.55	1.83	1.90	2.26	1.80	1.90	1.80	2.00
Marshall	S. C.	3.50^{7}	2.68	1.87	2.57	2.94	3.03	3.74	3.10	2.65	2.74	2.60	2.48	2.17	2.32
Birmingham...........	S. E.	......	3.00	3.35	^{e}2.96	^{c}3.21	2.60	2.71	2.07	1.74	2.84	^{e}3.04	3.68	3.93	3.87

---

* At the stations of the U. S. Signal Service the observations were made by exposing the test paper from 7 A. M. to 3 P. M., 75th Meridian time. The corresponding local time for each of these stations is stated in the (*) foot-note to Table I., page 19.

† The names of observers, their places of observation, and the counties in which these places are situated are stated in Exhibit 1, page 2. The full names of the divisions and the counties in each division are stated in Exhibt I, in a paper which follows, on weekly reports of sickness.

‡ Numbers in this column state the average annual relative amount of ozone by day for periods of years ending in each case with Dec. 31, 1887. The small figures above and at the right of numbers which state the average denote the number of years included in the average.

§ This line is an average for only the stations from which statements, nearly complete, were received for every month in the year. It does not include Mackinaw City, Port Austin, Port Huron, Swartz Creek, Grand Haven, Battle Creek or Ionia.

‖ The average for 11 months in 1887 is 2.48. ¶ For 11 months, 3.66. ** For 7 months, 2.80. †† For 9 months, 2.06. ‡‡ For 7 months, 1.13. §§ For 9 months, 3.09. ‖‖ For 11 months, 2.17.

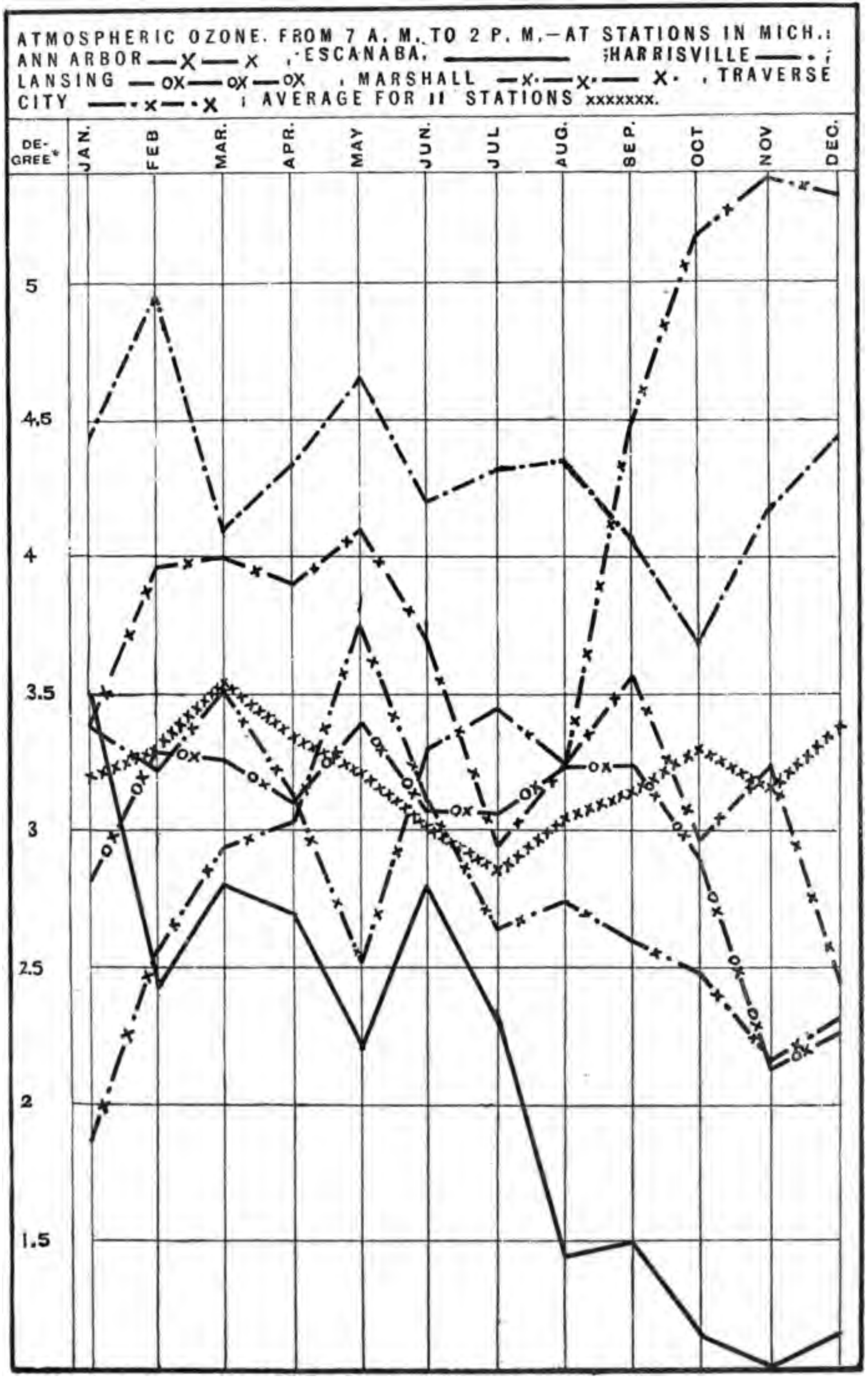
a, b, c. In the columns from January to December inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

a For 30 days. b For 29 days. c For 28 days. d For 27 days. e For 26 days. f For 24 days.

NOTE.—The computations were furnished by the observers at Ann Arbor for the year; at Mackinaw City for Feb., April, May and June; at Escanaba, Jan. and March to July; at Grand Haven, Feb. to May, and July to Dec. All other computations for Table VIII. were made in the office of the State Board of Health.

Eight lines in this table are graphically represented in Diagram VIII., page 55.

DIAGRAM VIII.—OZONE, AV. BY DAY, MONTHS IN 1887.



*SCALE, 1 DEG. OF COLORATION (ON SCALE OF 10 DEGS.) TO 1.46 IN. VERTICALLY.
H. B. T., DEL. DES. BY H. B. B.

TABLE IX.—*Relative amount of Ozone in the Atmosphere at Night, during the Year, and during each Month of the Year 1887, at 11 Stations in Michigan,—as indicated by Averages of Observations made Nightly by Exposing Test-paper, prepared according to Schönbein's formula, from 9 P. M. to 7 A. M.,—Recorded according to a Scale of 10 Degrees of Coloration of the Test-paper (greatest coloration by Ozone equals 10), by Observers for the State Board of Health, and for the U. S. Signal Service.**

Stations in Michigan. † (Those of the U. S. Signal Service in Italics.)	Divisions of the State.†	Degrees of Coloration of Test-paper—Night Observations.													
		Year.		Months, 1887.											
		Norm. ‡	1887.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 11 Stations §.	....	......	3.42	3.81	4.21	3.53	3.55	3.34	3.22	2.92	3.02	3.16	3.39	3.31	3.62
Marquette	U. P.	3.40^{9}	3.53	7.19	6.86	3.42	3.03	2.42	2.07	2.48	2.16	2.67	3.97	2.87	3.23
Escanaba	U. P.	......	2.07	3.20	2.61	2.80	2.70	2.10	2.90	2.40	1.48	1.23	1.16	1.00	1.23
Traverse City	N. W.	2.96^{6}	3.90	[g] 3.63	3.46	3.55	3.27	2.65	3.40	3.06	3.23	3.67	5.35	5.60	5.94
Mackinaw City	N.	......	‖	2.06	2.40	2.20	2.90	3.60	3.20	2.58	1.81	1.30	1.81	2.23	.....
Alpena	N. E.	4.04^{9}	5.48	4.84	5.32	4.58	5.43	4.65	5.03	5.16	5.84	6.43	5.45	5.73	7.32
Harrisville	N. E.	5.33^{3}	5.06	5.10	6.04	4.71	5.43	4.90	5.00	4.81	5.55	4.70	5.13	5.00	4.35
Grand Haven	W.	......	¶	.....	2.40	2.00	3.60	4.30	4.42	4.30	3.80	4.40	4.60	3.40	2.60
Port Austin	B. & E.	......	**	.....	.....	.....	.....	.....	[d] 3.44	2.81	2.97	[b] 3.24	[a] 3.97	4.10	[a] 5.30
Port Huron	B. & E.	......	††	2.84	2.71	1.94	2.10	1.84	1.67	1.65	2.48	.....	.....	.....	[d] 3.33
Thornville	B. & E.	3.23^{11}	2.97	3.65	4.29	3.42	3.33	2.87	2.50	2.48	2.00	2.50	2.42	2.80	3.39
Ionia	C.	......	‡‡	1.29	1.86	1.39	1.90	1.29	.....	.....	.....	.....	.....	[c] 0.25	[a] 0.30
Lansing, S. B. of H.	C.	3.69^{9}	3.04	2.71	3.64	3.03	2.80	3.68	3.53	3.16	2.68	2.63	3.03	2.53	3.03
Swartz Creek	C.	......	§§	3.66	5.70	4.00	[b] 4.52	3.71	[b] 2.78	2.30	[a] 2.08	2.75	.....	.....	.....
Ann Arbor	S. C.	2.71^{6}	3.46	3.68	4.68	4.35	4.40	4.16	3.60	[d] 2.74	2.74	3.27	[a] 2.70	2.57	2.61
Battle Creek	S. C.	......	‖‖	1.87	.....	[c] 2.18	[b] 1.72	2.23	1.87	2.19	1.77	3.30	2.48	2.30	1.71
Kalamazoo	S. C.	2.97^{11}	2.51	3.10	3.64	2.90	2.43	2.81	2.47	1.71	1.94	1.97	2.10	2.20	2.81
Marshall	S. C.	3.05^{7}	2.63	1.81	2.64	2.74	3.60	3.77	2.80	2.42	2.68	2.50	2.48	2.03	2.06
Birmingham	S. E.	......	3.00	[a] 2.97	[e] 3.08	[c] 3.32	2.60	2.74	2.17	1.71	2.87	[f] 3.16	3.52	4.03	3.81

---

* At the U. S. Signal Service Stations for the year 1887, the observations were made by exposing the test-paper from 10 P. M. to 7 A. M., 75th Meridian time. The corresponding local time for each of these stations is stated in star (*) foot-note to Table I., page 19.

† The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1., page 2. The full names of the divisions and the counties in each division are stated in Exhibit I., in a paper which follows on weekly reports of sickness.

‡ Numbers in this column state the average annual relative amount of ozone by night for periods of years ending in each case with Dec. 31, 1887. The small figures above and at the right of numbers which state the average, denote the number of years included in the average.

§ This line is an average for only the stations from which statements, nearly complete, were received for every month in the year. It does not include Mackinaw City, Port Austin, Port Huron, Swartz Creek, Grand Haven, Ionia, or Battle Creek.

‖ The average for 11 months is 2.37. ¶ For 11 months, 3.62. ** For 7 months, 3.69. †† For 9 months, 2.28. ‡‡ For 7 months, 1.18. §§ For nine months, 3.50. ‖‖ For 11 months, 2.15.

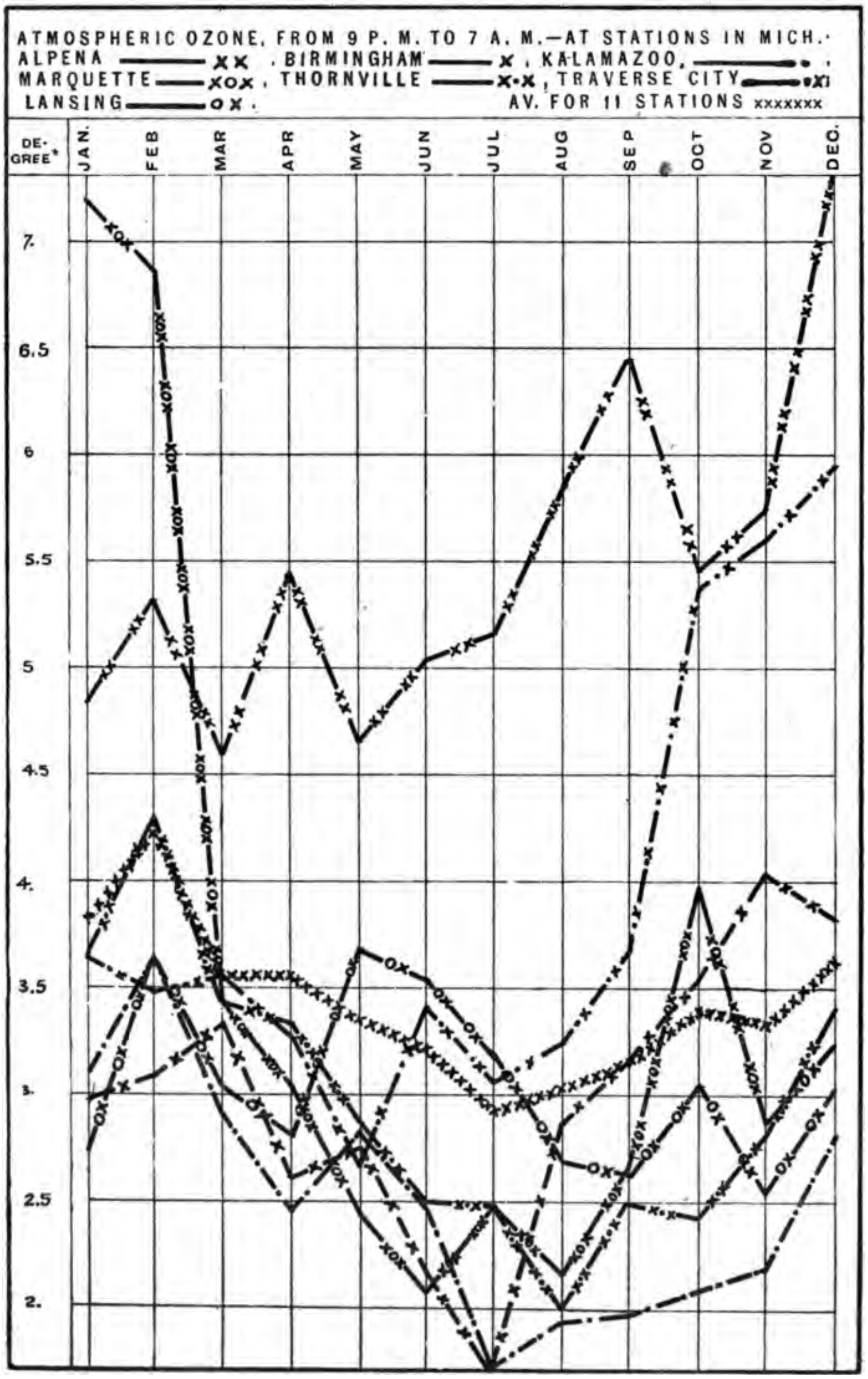
a, b, c. In the columns from January to December, inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

a For 30 days. b For 29 days. c For 28 days. d For 27 days. e For 26 days. f For 25 days. g For 24 days.

NOTE.—The computations were furnished by the observers at Ann Arbor for the year; at Mackinaw City, Feb., Apr., May and June; at Escanaba, Jan. and May to July; at Grand Haven, Feb. to May and July to Dec. All other computations in Table IX. were made at the office of the State Board of Health.

Seven lines in this table are graphically represented in Diagram IX., page 57.

DIAGRAM IX.—OZONE, AV. BY NIGHT, MONTHS IN 1887.



*Scale, 1 Deg. of Coloration (on Scale of 10 Degs.) to 1.13 in Vertically
H. B. T., Del. Des. by H. B. B.

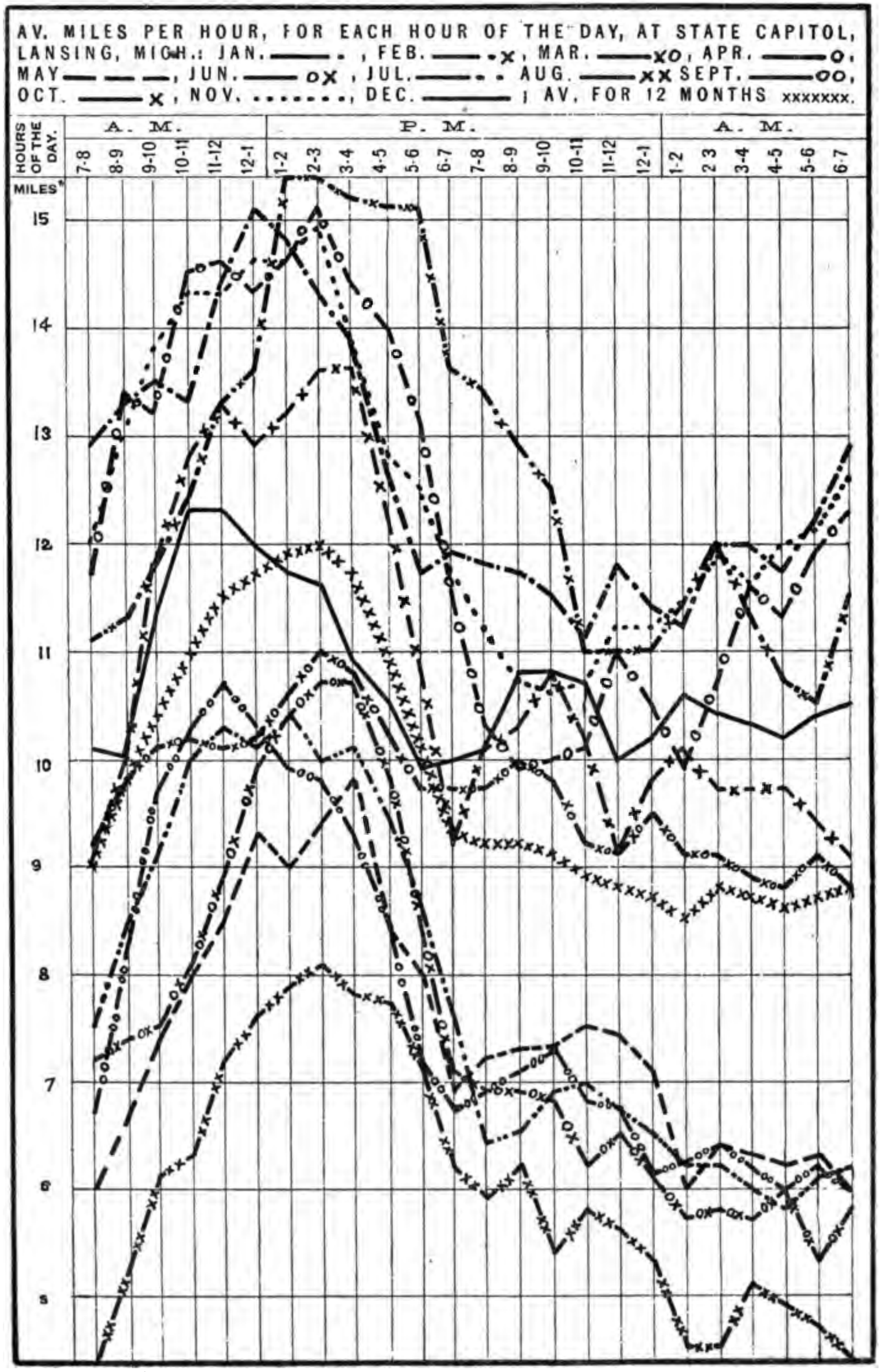
TABLE X.—*Average velocity of the Wind in Miles per Hour, for each Hour of the Day, by Months of the year 1887. Compiled from Registers of the Robinson's Self-Registering Anemometer, exposed above the roof of the Capitol, and registering in the office of the State Board of Health, Lansing, Michigan.*

Months.	Average.			Hours (1887) and Average Miles per Hour.																							
	Av. 8 years, 1880-87.	1886.	1887.	A. M.					P. M.												A. M.						
				7-8	8-9	9-10	10-11	11-12	12-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-1	1-2	2-3	3-4	4-5	5-6	6-7
Year	9.9	9.5	9.8	9.0	9.8	10.4	11.0	11.5	11.7	11.9	12.0	11.7	10.9	10.1	9.3	9.2	9.2	9.1	8.9	8.8	8.7	8.5	8.8	8.7	8.6	8.7	8.8
January*	11.5	10.6	12.6	12.9	13.3	13.5	13.3	14.4	15.1	14.8	14.3	13.9	12.6	11.7	11.9	11.8	11.7	11.5	11.1	11.8	11.4	11.2	12.0	12.0	11.7	12.2	12.9
February†	11.7	12.7	12.6	11.1	11.3	11.8	12.4	13.3	13.6	15.4	15.4	15.2	15.1	15.1	13.6	13.4	12.9	12.5	11.0	11.0	11.0	11.4	12.0	11.3	10.7	10.5	11.5
March	11.2	11.1	9.7	9.2	9.8	10.1	10.2	10.1	10.2	10.6	11.0	10.8	10.2	9.7	9.7	9.7	10.0	9.8	9.2	9.1	9.5	9.1	9.1	8.9	8.8	9.1	8.8
April‡	11.4	9.6	12.2	11.7	13.4	13.2	14.5	14.6	14.3	14.6	15.1	14.4	14.0	13.1	11.5	10.3	9.9	10.0	10.1	11.0	10.5	9.9	10.7	11.6	11.3	11.9	12.3
May§	9.6	8.2	7.4	6.0	6.7	7.4	8.0	8.5	9.3	9.0	9.4	9.8	8.4	8.0	6.9	7.2	7.3	7.3	7.5	7.4	7.1	6.0	6.4	6.3	6.2	6.3	6.0
June‖	8.5	7.5	7.5	7.2	7.4	7.5	8.1	8.9	9.9	10.4	10.7	10.7	9.8	8.4	7.1	6.9	6.9	6.8	6.2	6.5	6.1	5.7	5.8	5.7	6.0	5.3	5.8
July	8.3	6.6	7.8	7.5	8.5	9.1	10.0	10.3	10.1	10.4	10.0	10.1	9.4	8.6	7.6	6.4	6.5	6.9	7.0	6.7	6.5	6.2	6.2	6.0	5.8	6.1	6.2
August	7.3	7.2	6.0	4.4	5.3	6.1	6.3	7.2	7.6	7.9	8.1	7.8	7.7	7.1	6.2	5.9	6.2	5.4	5.8	5.6	5.3	4.5	4.5	5.1	4.9	4.7	4.4
September¶	8.5	8.9	7.7	6.7	8.3	9.7	10.3	10.7	10.3	9.9	9.8	9.3	8.4	7.2	6.7	6.9	7.1	7.3	6.8	6.7	6.1	6.2	6.4	6.2	6.0	6.2	6.0
October**	8.7	8.8	10.8	9.0	10.0	11.8	12.8	13.3	12.9	13.2	13.6	13.6	12.2	10.8	9.2	10.1	10.3	10.8	10.2	9.1	9.8	10.1	9.7	9.7	9.7	9.4	9.1
November	11.3	12.7	12.5	12.0	13.0	13.8	14.3	14.3	14.6	14.6	14.9	13.9	12.8	12.5	11.7	11.2	10.7	10.6	10.7	11.2	11.2	11.4	11.9	11.6	12.0	12.1	12.6
December††	11.0	10.2	10.7	10.1	10.0	11.3	12.3	12.3	12.0	11.7	11.6	10.9	10.5	9.9	10.0	10.1	10.8	10.8	10.7	10.0	10.2	10.6	10.4	10.3	10.2	10.4	10.5

* For only about 30 days. † For only about 27 days. ‡ For only about 29 days. § For only about 30 days. ‖ For only about 26 days. ¶ For only about 29 days. ** For only about 30 days. †† For only about 30 days.

The statements in the third figure column in Table X. of the average velocity of the wind in miles per hour, by months, during the year 1887, are graphically represented in Diagram XI., page 61. The remaining columns of Table X. for 1887 are graphically represented in Diagram X., page 59.

DIAGRAM X.—VELOCITY OF WIND, BY HOURS AND MONTHS, 1887.



*Scale One Mile per Hour to .58 In. Vertically

H. B. T., Del. Des. by H. B. B.

TABLE XI.—*Average Velocity of the Wind in Miles per Hour for the Year and for each Month of the Year 1887, at 9 Stations in Michigan. Computed from Registers of the Robinson's Self-Registering Anemometer,* by Observers for the State Board of Health, and for the U. S. Signal Service.*

Stations in Michigan.†	Divisions of the State.	Miles, by Self-Registering Anemometer.													
		Year.		Months in 1887.											
		Norm. ‡	1887.	Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 9 Stations....	....	......	9.6	11.6	11.1	9.9	10.7	7.4	6.9	7.8	7.0	8.4	11.5	11.6	11.0
Av. for 8 Stations§....	....	......	9.4	11.6	10.9	10.1	10.7	7.3	6.8	7.7	6.9	8.1	11.1	11.2	10.6
Marquette	U. P.	9.1^{9}	8.9	10.4	9.0	9.9	8.9	7.5	6 0	6.7	7.6	8.6	11.8	9.9	10.2
Escanaba..............	U. P.	8.6^{6}	8.3	8.5	8.4	9.2	8.4	7.0	7.0	7.3	7.4	8.1	10.4	9.0	9.0
Mackinaw City.......	N.	9.9^{4}	10.8	11.5	12.5	8.3	10.8	8.4	7.7	8.3	7.9	10.8	14.3	14.4	14.7
Alpena..................	N. E.	9.2^{6}	8.9	10.2	10.1	10.1	9.3	5.3	6.5	7.2	7.3	8.1	11.2	10.6	10.5
Grand Haven..........	W.	11.0^{6}	11.1	14.0	12.9	11.2	13.3	8.6	8.0	9.0	7.2	8.8	13.4	13.8	12.8
Port Huron............	B. & E.	9.6^{6}	11.1	14.5	13.2	12.0	12.5	9.0	8.0	9.5	7.9	9.5	12.3	12.8	12.0
Lansing, S. B. of H....	C.	9.9^{8}	9.8	12.6	12 7	9.7	12.2	7.4	7.0	7.7	6.0	7.7	10.9	12.5	10.7
Ann Arbor.............	S. C.	9.1^{6}	8.7	11.7	11.0	10.1	11.3	6.7	5.9	6.4	5.2	6.2	9.1	10.1	8.9
Detroit..................	S. E.	9.4^{6}	8.8	11.2	9.8	8.7	9.6	6.7	5.8	8.0	6.6	8.1	9.7	10.9	10.5

* Gibbon's Anemometer was used at Ann Arbor.

† The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1, page 2.

‡ Numbers in this column state the average velocity of the wind in miles per hour for periods of years ending in each case with Dec. 31, 1887. The small figures above and at the right of numbers which state the average denote the number of years included in the average.

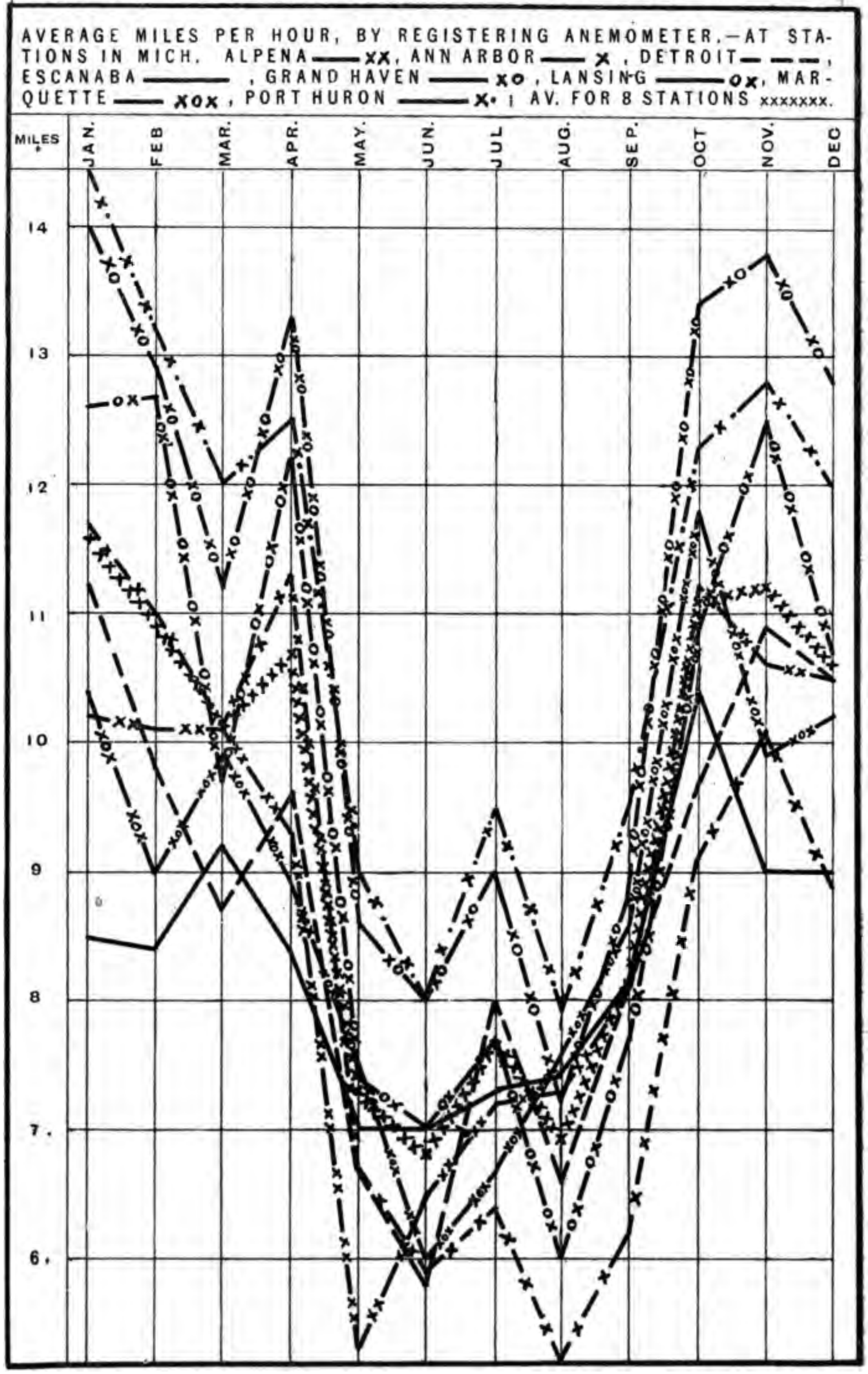
§ Not including Mackinaw City.

Graphic representations of statements made in Table XI. are given in Diagram XI., page 61.

EXHIBIT 27.—*Average Velocity of the Wind in Miles per Hour, by Months for the 7 Years, 1880–86, and comparisons of 1887 with this average and with the Year 1886. From Registers of the Robinson's Self-Registering Anemometer in the office of the State Board of Health, State Capitol, Lansing, Michigan.*

Years, Etc.	Miles, by Self-Registering Anemometer.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 7 y'rs 1880–86.	9.9	11.3	11.6	11.4	11.3	9.9	8.7	8.4	7.5	8.6	8.4	11.1	11.1
1886....................	9.5	10.6	12.6	11.1	9.6	8.2	7.5	6.6	7.2	8.9	8.8	12.6	10.3
1887....................	9.8	12.6	12.7	9.7	12.2	7.4	7.0	7.7	6.0	7.7	10.9	12.5	10.7
In 1887 **Greater** than Av. 7 years, 1880–86............	......	1.3	1.1	......	0.9	......	......	......	......	......	2.5	1.4	......
In 1887 **Less** than Av. 7 years, 1880–86.	0.1	......	......	1.7	......	2.5	1.7	0.7	1.5	0.9	......	......	0.4
In 1887 **Greater** than in 1886	0.3	2.0	0.1	......	2.6	......	......	1.1	......	......	2.1	......	0.4
In 1887 **Less** than in 1886..................	-- ---	......	......	1.4	......	0.8	0.5	......	1.2	1.2	......	0.1	......

DIAGRAM XI.—VELOCITY OF WIND, BY MOS. IN 1887.



*Scale, One Mile per Hour to .69 In. Vertically.

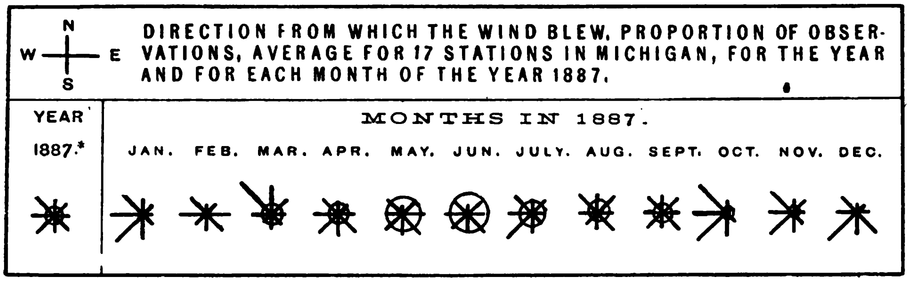
H. B. T. Del. Des. by H. B. B.

EXHIBIT 26.—*Average Velocity of the Wind in Miles per hour by Year and Months in 1887, Compared with Annual and Monthly Averages for 1886, and for the 5 years 1882-6. From Registers of the Robinson's Self-Registering Anemometer.* These Averages are for Groups of Several Stations in Michigan.*

Years, Etc.	Average Miles per Hour.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 5 Years, 1882-86*.	9.5	11.2	10.4	10.2	10.0	9.5	8.1	7.9	7.6	8.5	9.1	10.7	10.7
1886 (9 stations*)......	9.2	10.5	11.2	10.1	8.7	8.4	7.3	7.0	7.4	9.0	8.8	12.0	10.3
1887 (9 stations*)......	9.6	11.6	11.1	9.9	10.7	7.4	6.9	7.8	7.0	8.4	11.5	11.6	11.0
In 1887, **Greater** than the Av. for 5 years, 1882-86........	0.1	0.4	0.7	0.3	0.7	......	......	......	......	......	2.4	0.9	0.3
In 1887, **Less** than the Av. for 5 years, 1882-86..............	......	......	......	......	......	2.1	1.2	0.1	0.6	0.1	......	......	......
In 1887, **Greater** than in 1886..........	0.4	1.1	......	......	2.0	......	......	0.8	......	......	2.7	......	0.7
In 1887, **Less** than in 1886..............	......	......	0.1	0.2	......	1.0	0.4	......	0.4	0.6	......	0.4	......

* Gibbon's Anemometer was used at Ann Arbor.

DIAGRAM XIII.—WIND, DIRECTION, IN MICH., YEAR AND MONTHS, 1887.



DIRECTION FROM WHICH THE WIND BLEW, PROPORTION OF OBSERVATIONS, AVERAGE FOR 17 STATIONS IN MICHIGAN, FOR THE YEAR AND FOR EACH MONTH OF THE YEAR 1887.

*SCALE RADIUS .01 OF ONE INCH TO ONE OBSERVATION.
H. B. T., DEL. DES. BY H. B. B.

EXHIBIT 28.—DIRECTION OF WIND, 1878-86.—*Number of Observations per Month (at 7 A. M., 2 P. M. and 9 P. M.* Daily) at which the Wind was Blowing from the several (eight) Points of Compass. Annual and Monthly Averages for the 9 Years 1878-86, at Stations in Michigan.*†

Points of Compass.	Average Number of Observations per Month.—9 Years, 1878-86.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
All observations.....	91	93	85	93	90	93	90	93	93	90	92	90	93
Calm.................	5	4	4	4	4	5	5	7	8	6	5	4	4
North................	7	6	6	9	9	8	8	8	8	5	7	5	5
Northeast............	8	6	7	9	12	12	9	8	10	7	8	5	5
East.................	6	5	5	7	9	7	6	4	6	6	5	4	5
Southeast............	9	9	9	9	10	10	10	7	9	10	10	8	8
South................	10	11	10	7	8	10	11	10	10	13	13	11	10
Southwest............	18	22	16	13	12	16	15	18	17	19	19	20	23
West.................	14	16	14	14	10	13	13	17	12	13	13	18	19
Northwest............	14	14	13	19	16	13	11	13	13	11	13	15	15

* At stations of the U. S. Signal Service the observations were made at 7 A. M., 3 P. M., and 11 P. M., 75th Meridian time.

† At 12 stations in 1878; 16 in 1879; 19 in 1880; 19 in 1881; 21 in 1882; 19 in 1883; 21 in 1884; 21 in 1885, and 16 in 1886.

TABLE XII.—*Number of Observations per Month (at 7 A. M., 2 P. M., and 9 P. M.,* Daily), at which the wind was Blowing from each of the Eight Principal Points of Compass, during the Year and during each month of the Year 1887. Average for 17 Stations in Michigan.*†

Points of Compass.	Average Number of Observations per Month, 1887.												
	Year.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
All observations.....	91	93	83	92	90	93	89	92	93	88	92	90	93
Calm.................	5	2	2	5	5	8	9	7	6	5	3	3	2
North................	8	8	5	15	6	5	5	8	11	9	7	7	5
Northeast............	9	6	7	11	7	10	10	10	13	10	3	9	6
East.................	8	5	12	7	9	12	9	6	8	10	2	6	7
Southeast............	11	7	12	7	14	14	14	7	13	13	7	8	15
South................	10	13	9	8	12	11	10	10	9	8	12	11	12
Southwest............	14	20	9	7	14	12	11	18	9	12	21	17	21
West.................	13	17	15	11	13	9	12	13	10	10	18	13	12
Northwest............	14	16	12	23	11	11	9	13	14	11	21	16	12

* At stations of the U. S. Signal Service the observations were made at 7 A. M., 3 P. M. and 10 P. M., 75th Meridian time.

† The names of observers, their places of observation, the counties and divisions of the State in which those places are situated are stated in Exhibit 1, page 2.

Graphic representations of statements in Table XII. are given in Diagram XIII., page 62.

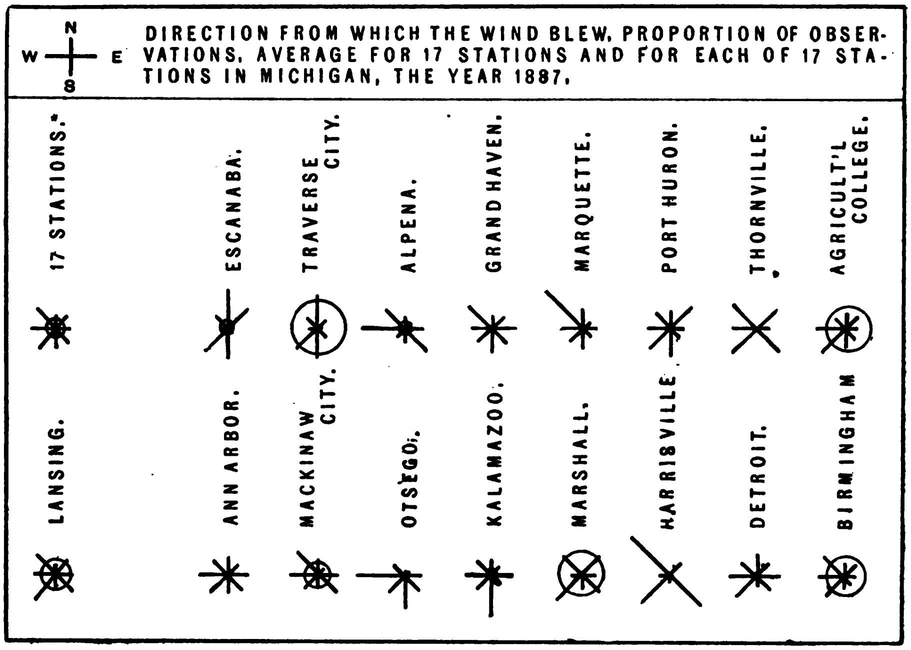
The construction and purport of the diagrams relating to direction of wind may be explained as follows:

In diagrams XII., XIII., and XIV., pages 66, 62 and 64, relating to the direction of the wind, the single figures or separate groups of lines are designed to indicate by the length of the lines the number and the proportion of regular observations at 7 A. M, 2. P. M. and 9. P. M.,* daily, at which the wind was blowing from each of the eight principal points of compass at the places and for the periods of time stated in the margin; and by the direction of the lines on the page, the direction of the wind. Each figure consists of lines drawn to a common center from some or all of the following directions on the page and indicating that at the times of observation the wind blew from points of the compass as follows: Lines toward the common center from the top of the page indicate observations that the wind was blowing from the north; from the right-hand side, observations that the wind was from the east; from the bottom of the page, that it was from the south; from the left-hand side, that it was from the west; from the upper left-hand corner, that it was from the northwest; from the upper right-hand corner, that it was from the northeast; from the lower right-hand corner, that it was from the southeast; from the lower left-hand corner that it was from the southwest. The number of regular observations at which the wind was blowing from the direction denoted by a line is indicated by the length of that line, .01 of an inch being the unit or the length of line for one observation. The circles indicate calms, the number of regular observations at which there was no wind being denoted by the length of the *radius* of the circle drawn about the point of convergence of the lines for a given place or period of time, the length for one observation being, as before, .01 of an inch. Thus, by Diagram XII., page 66, or by Table XIV., pages 67-70, it appears that at Alpena, in August, 1887, at 1 of the regular tri-daily observations for the month there was a calm; at 28 observations the wind was blowing from the west; at 13 from the northwest; at 11 from the northeast, etc. For convenient study the top of these diagrams should be held toward the north. Definite numerical statements corresponding to these diagrams are given in Tables XII., XIII. and XIV., pages 63, 65, and 67-70.

---

*At the stations of the U. S. Signal Service the observations were made at 7 A. M., 3 P. M., and 10 P. M., 75th Meridian time.

DIAGRAM XIV.—WIND, DIRECTION, AT STATIONS IN MICHIGAN, 1887.



H. B. T., DEL. DES. BY H. B. B.

*SCALE, RADIUS .01 OF ONE INCH TO ONE OBSERVATION. NUMERICAL STATEMENTS CORRESPONDING TO LINES IN THIS DIAGRAM ARE GIVEN IN TABLE PAGE

TABLE XIII.—*Average Number of Observations per month for the Year 1887, at which the Wind was Blowing from each of the Eight Principal Points of the Compass, at each of 17 Stations* in Michigan; also the Average for the 17 Stations.*†

Stations in Michigan. (Those of the U. S. Signal Service in Italics.)	Divisions of the State.††	Average Number of Observations Per Month in 1887.									
		All Obs.	Calms.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.
Average for 17 Stations		91	5	8	9	8	11	10	14	13	14
Marquette	U P.	91	1	10	6	8	7	11	10	12	28
Escanaba	U. P.	91	4	20	14	3	4	16	17	4	9
Traverse City	N. W.	91	14	18	7	2	7	16	15	4	8
Mackinaw City	N.	91	7	8	5	11	13	6	10	14	16
Alpena	N. E.	91	4	6	4	10	17	8	7	23	14
Harrisville	N. E.	91	0	1	9	1	24	3	22	4	28
Grand Haven	W.	91	1	7	8	13	11	13	10	11	17
Port Huron	B. & E.	91	0	9	16	7	7	15	15	12	11
Thornville	B. & E	91	2	0	14	7	17	2	18	14	18
Agricultural College	C.	91	12	8	9	7	8	10	17	15	7
Lansing, S. B. of H.	C.	91	8	4	9	7	13	7	18	12	14
Otsego	S. W.	89	1	2	2	9	11	18	12	26	8
Ann Arbor	S. C.	91	1	8	7	11	11	11	14	17	11
Kalamazoo	S. C.	91	3	8	6	11	7	22	10	15	10
Marshall	S. C.	91	12	2	18	7	13	7	19	6	14
Birmingham	S. E.	86	11	6	8	6	6	7	14	14	15
Detroit	S. E.	91	2	12	10	12	10	5	15	15	11

---

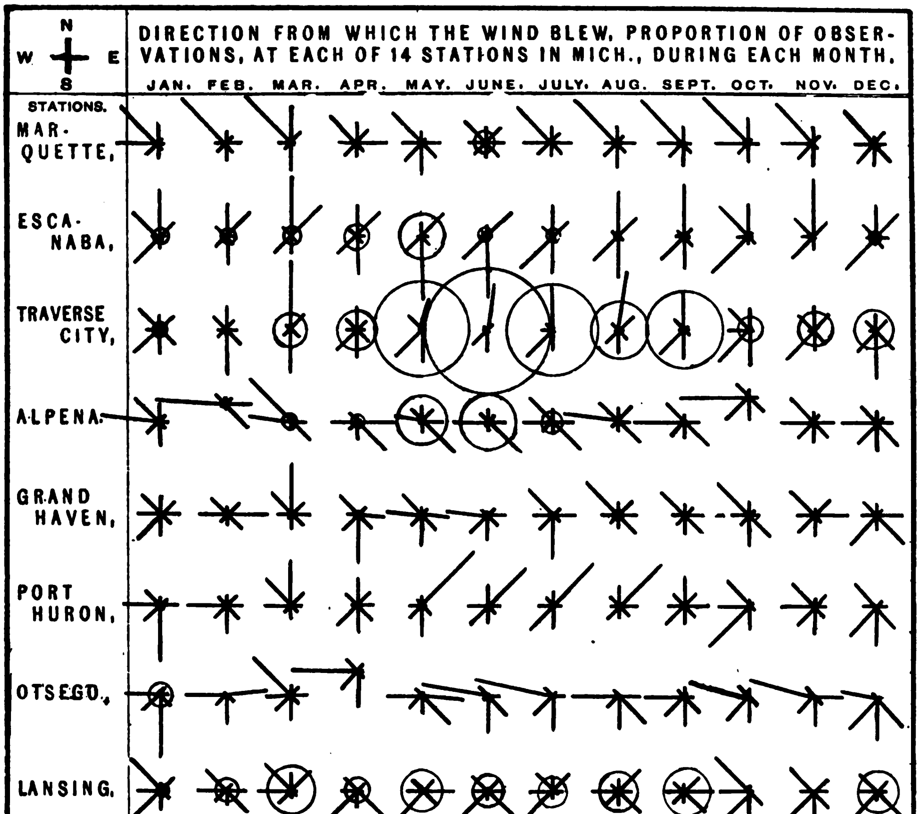
* At the stations of the U. S. Signal Service the observations were made at 7 A. M., 3 P. M., and 10 P. M., 75th meridian time.

† The names of observers, their places of observation, and the counties and divisions of the State in which these places are situated are stated in Exhibit 1, page 2.

†† The full names of the divisions, and the counties in each division, are stated in Exhibit I., in a paper which follows on weeekly reports of sickness.

Graphic representations of statements in Table XIII. are given in Diagram XIV., page 64.

DIAGRAM XII.—WIND, DIRECTION, AT STATIONS, BY MONTHS, IN 1887.



*SCALE, RADIUS .01 OF ONE INCH TO ONE OBSERVATION.
H. B. T. DEL.   DES. BY H. B. B.

TABLE XIV.—*Number of Observations for each Month of the year 1887, at which the wind was Blowing from each of the eight Principal Points of the Compass, at each of the 23 Stations* in Michigan; also the average for 17 of the said Stations from which nearly Complete Observations were received for the Year. (Observations were made at 7 A. M., 2 P. M. and at 9 P. M., Daily.)*†

Stations in Michigan. (Those of U. S. Signal Service in Italics.)	Divisions of the State.*	January.										February.										March.									
		Total.	Calm.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.	Total.	Calm.	N.	N. E	E.	S. E.	S.	S. W.	W.	N. W.	T tal.	Calm.	N.	N. E	E.	S. E.	S.	S. W.	W.	N. W.
Av. for 17 Stat'ns‡	....	93	2	8	6	5	7	13	20	17	16	83	2	5	7	12	12	9	9	15	12	92	5	15	11	7	7	8	7	11	23
Ripley	U. P.	84	1	15	5	10	15	6	1	4	27	84	0	13	1	15	15	6	4	10	20	92	0	13	3	9	19	8	4	12	24
Marquette	U. P.	93	0	12	3	3	4	9	11	22	29	84	1	6	5	10	6	10	7	6	33	96	0	20	8	2	2	15	5	7	34
Gulliver Lake	U. P.	93	5	20	13	2	3	5	12	5	28	......	......	....	....	....	....	..	....	....	....	......	......	....	....	....	....	..	....	....	....
Escanaba	U. P.	93	4	25	12	1	2	6	19	5	10	83	4	18	18	5	5	14	8	2	9	93	5	32	22	1	5	9	12	1	6
Traverse City	N. W.	93	4	8	11	3	12	15	18	7	15	84	2	14	7	5	10	23	7	5	11	93	9	36	11	1	6	23	4	0	3
Mackinaw City	N.	93	2	16	2	7	9	10	12	23	12	84	6	5	1	23	12	2	7	23	5	93	18	7	6	11	6	1	2	23	19
Alpena	N. E.	93	1	9	4	4	5	13	9	30	18	84	0	3	3	13	17	2	2	37	7	93	4	4	2	8	15	4	1	23	32
Harrisville	N. E.	93	0	1	8	2	20	6	19	9	28	84	0	1	10	1	13	5	22	5	27	93	0	1	10	3	9	4	17	8	41
Grand Haven	W.	93	0	10	10	10	7	12	18	12	14	84	1	4	9	21	11	5	6	15	12	93	1	28	9	10	9	9	4	7	16
Port Austin	B. & E.	......	......	....	....	....	....	..	....	....	....	......	......	....	....	....	....	..	....	....	....	......	......	....	....	....	....	..	....	....	....
Port Huron	B. & E.	93	0	3	5	10	3	30	12	19	11	84	1	6	7	8	10	15	10	20	7	93	0	25	9	6	5	8	6	15	19
Thornville	B. & E.	93	2	0	7	7	14	0	29	10	24	84	0	0	15	8	14	1	5	26	15	93	1	0	21	5	7	0	12	9	38
Agr'l College	C.	93	6	5	10	3	0	13	27	19	10	84	5	4	8	17	9	6	11	18	6	93	13	10	16	9	5	4	6	16	14
Ionia	C.	93	0	6	8	6	7	4	37	13	12	84	0	3	6	15	20	3	17	16	4	93	0	16	19	5	11	3	12	7	20
Lansing, S. B. of H.	C.	93	3	4	9	3	6	11	22	12	23	84	6	1	4	10	16	8	9	15	15	93	12	9	14	3	3	4	10	18	20
Swartz Creek	C.	89	1	3	9	2	4	5	33	13	19	84	1	0	12	3	20	5	16	5	22	92	2	4	20	2	12	2	11	7	32
Otsego	S. W.	92	6	1	4	4	8	33	15	19	2	78	0	0	1	21	9	16	8	21	2	93	1	5	5	8	6	14	12	13	29
Ann Arbor	S. C.	93	0	3	4	5	4	16	18	35	8	84	4	3	6	15	9	7	9	20	11	93	0	17	7	11	8	8	3	12	27
Battle Creek	S. C.	93	0	4	5	7	19	18	11	15	14	......	......	....	....	....	....	..	....		....	86	11	6	8	5	8	13	8	11	16
Kalamazoo	S. C.	93	1	8	4	10	8	24	18	14	6	84	2	3	6	18	11	11	11	15	7	93	0	12	5	16	5	11	2	15	27
Marshall	S. C.	93	2	2	11	10	1	12	38	7	10	84	2	0	11	7	21	7	17	3	16	93	11	1	21	5	8	4	11	5	27
Birmingham	S. E.	92	0	7	2	6	2	8	24	17	26	78	2	4	6	4	16	7	8	20	11	82	6	13	8	8	1	8	5	7	26
Detroit	S. E.	93	0	15	3	5	6	1	25	27	11	84	3	11	7	11	10	8	9	12	13	93	0	30	14	13	11	4	6	7	8

Diagram XII., page 66, gives 14 lines in this table, and is explained on page 64. * For names of observers, etc., see Exhibit 1, page 2. For names of divisions, etc., see Exhibit I, in a paper which follows on weekly reports of sickness. †With exceptions stated for U. S. Signal Service Stations in Table I., page 19. ‡ This line includes only the 17 stations from which statements complete, or nearly complete, were received for every month of the year; it does not include Gulliver Lake, Port Austin, Swartz Creek, Battle Creek, Ripley and Ionia.

TABLE XIV.—CONTINUED.—*Direction of Wind, Months in 1887.—Observations at which the Wind was blowing from Direction named.*

Stations in Michigan.* (Those of U. S. Signal Service in Italics.)	Divisions of the State.*	April.										May.										June.									
		Total.	Calm.	N.	N. E.	E.	S. E.	S.	S.W.	W.	N.W.	Total.	Calm.	N.	N.E.	E.	S. E	S.	N.W.	W.	N.W	Total.	Calm.	N.	N. E.	E.	S. E.	S	S.W.	W.	N.W.
Av. for 17 Stat'ns‡	....	90	5	6	7	9	14	12	14	13	11	93	8	5	10	12	14	11	12	9	11	89	9	5	10	9	14	10	11	12	9
Ripley	U. P.	90	1	20	5	23	14	6	0	10	11	93	3	17	3	42	14	1	3	8	2	----	----	----	----	----	----	----	----	----	----
Marquette	U. P.	90	1	11	10	16	6	7	9	10	20	93	1	6	3	10	11	17	13	10	22	90	6	8	12	10	11	8	9	10	16
Gulliver Lake	U. P.	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	90	9	4	4	4	25	19	3	1	21
Escanaba	U. P.	90	7	17	18	4	4	20	14	1	5	93	12	8	17	4	6	33	11	2	0	90	4	6	19	4	1	32	17	4	3
Traverse City	N. W.	90	11	12	7	4	8	15	19	6	8	93	24	17	3	0	1	17	19	2	10	90	33	24	4	0	2	11	11	3	2
Mackinaw City	N.	90	17	3	2	16	13	1	12	12	14	93	6	0	4	16	24	3	10	12	18	90	9	7	6	10	22	3	8	11	14
Alpena	N. E.	90	4	3	2	19	23	10	6	15	8	93	13	7	8	11	24	6	2	15	7	90	15	7	4	10	25	5	2	17	5
Harrisville	N. E.	90	0	0	8	1	46	1	14	0	20	93	0	2	8	0	35	2	9	2	35	90	0	0	16	0	32	2	17	1	22
Grand Haven	W.	90	0	1	7	14	10	26	12	6	14	93	0	5	5	14	11	15	8	19	16	90	1	3	6	11	9	13	13	20	14
Port Austin	B. & E.	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	90	9	9	21	5	5	13	12	10	6
Port Huron	B. & E.	90	1	15	10	9	11	15	16	4	9	92	0	5	40	3	7	17	10	7	3	90	0	11	29	8	6	10	14	11	1
Thornville	B. & E.	90	2	1	8	9	21	0	25	11	13	93	0	0	13	17	16	6	19	13	9	90	2	0	17	8	27	0	16	12	8
Agr'l College	C.	90	8	4	6	8	11	14	15	16	8	93	25	3	7	11	9	10	12	10	6	90	19	6	9	9	11	7	12	11	6
Ionia	C.	90	0	5	1	12	18	12	14	21	7	93	0	6	23	17	8	7	21	8	3	----	----	----	----	----	----	----	----	----	----
Lansing, S. B. of H.	C.	90	7	2	5	3	23	9	22	9	10	93	11	3	8	17	11	1	26	8	8	90	9	2	8	9	18	5	21	7	11
Swartz Creek	C.	90	2	0	12	0	25	2	30	6	13	92	1	3	28	1	13	5	26	5	10	89	6	2	11	6	23	3	18	12	8
Otsego	S. W.	88	0	0	5	3	5	19	13	34	9	92	0	1	3	22	22	12	9	18	5	87	2	1	0	6	14	20	2	35	7
Ann Arbor	S. C.	90	1	2	6	13	15	9	17	20	7	93	0	11	7	17	20	10	11	9	8	90	3	8	6	18	13	8	11	19	4
Battle Creek	S. C.	89	5	3	5	7	16	20	13	12	8	91	20	2	8	9	14	20	6	9	3	90	1	5	3	5	25	10	14	16	11
Kalamazoo	S. C.	90	1	3	4	10	8	33	8	14	9	93	5	5	13	17	8	24	5	10	6	90	5	3	9	12	5	27	7	17	5
Marshall	S. C.	90	11	0	8	6	17	3	16	15	14	93	19	1	10	15	12	8	12	2	14	90	16	1	15	5	18	5	16	2	12
Birmingham	S. E.	89	11	9	2	7	7	16	7	23	7	88	18	4	9	12	11	4	12	8	10	84	17	2	7	12	7	4	8	13	14
Detroit	S. E.	90	1	12	7	15	12	9	10	18	6	93	7	6	12	20	9	9	13	12	5	90	9	3	9	15	14	8	6	18	8

*‡ For these references see foot-notes to this table on page 67.
NOTE.—Graphic representations of statements for 14 lines in this table are given in Diagram XII., page 66, which is explained on page 64.

TABLE XIV.—CONTINUED.—*Direction of Wind, Months in 1887.—Observations at which the Wind was Blowing from Directions Named.*

Stations in Michigan.* (Those of U. S. Signal Service in Italics.)	Divisions of the State.*	July.										August.										September.									
		Total.	Calm.	N.	N. E.	E.	S. E.	S.	S.W.	W.	N.W.	Total.	Calm.	N.	N. E.	E.	S. E.	S.	S.W.	W.	N.W.	Total.	Calm.	N.	N. E.	E.	S. E.	S.	S.W.	W.	N.W.
Av. for 17 Stat'ns‡	....	92	7	8	10	6	7	10	18	13	13	93	6	11	13	8	13	9	9	10	14	88	5	9	10	10	13	8	12	10	11
Ripley	U. P.	------	------	----	----	----	----	--	----	----	----	69	3	6	4	23	2	2	2	23	4	59	6	2	2	26	1	0	4	14	4
Marquette	U. P.	93	2	9	7	11	8	7	9	14	26	93	1	10	6	10	7	12	9	6	32	90	0	10	2	5	7	13	9	13	31
Gulliver Lake	U. P.	93	12	2	0	0	17	24	10	4	24	93	15	11	1	3	10	16	7	10	20	90	11	8	6	7	14	16	11	4	13
Escanaba	U. P.	93	4	18	12	2	4	19	24	2	8	93	2	24	14	0	4	22	19	3	5	90	2	28	7	2	7	17	17	5	5
Traverse City	N. W.	93	24	23	3	1	2	11	19	6	4	93	15	31	11	2	6	12	9	2	5	90	20	20	3	2	5	15	17	2	6
Mackinaw City	N.	93	11	9	3	7	11	7	11	18	16	93	7	16	10	4	11	10	4	11	20	90	4	3	11	10	21	4	11	11	15
Alpena	N. E.	93	6	6	1	12	22	7	8	15	16	93	1	7	11	6	17	6	4	28	13	90	0	4	2	8	18	8	9	26	15
Harrisville	N. E.	93	0	1	1	0	27	3	23	4	34	93	0	0	12	0	34	2	7	6	32	90	0	1	9	2	21	2	25	7	23
Grand Haven	W.	93	0	3	6	13	5	23	10	10	23	93	3	8	11	10	14	7	6	9	25	90	1	6	7	21	15	10	6	6	18
Port Austin	B. & E.	93	12	21	16	3	0	8	25	5	3	93	13	20	22	11	4	10	5	3	5	90	13	20	13	7	0	10	16	8	3
Port Huron	B. & E.	93	0	7	32	5	1	13	19	9	7	93	0	11	33	10	8	8	11	5	7	90	0	16	9	12	8	11	16	9	9
Thornville	B. & E.	93	3	0	19	4	9	2	25	10	21	93	2	0	25	8	17	4	6	9	22	90	4	1	24	5	20	0	17	10	9
Agr'l College	C.	93	16	17	8	4	3	8	17	17	3	93	22	20	12	4	14	2	8	10	1	90	13	12	14	7	11	6	16	7	4
Ionia	C.	------	------	----	----	----	----	--	----	----	----	------	------	----	----	----	----	--	----	----	----	------	------	----	----	----	----	--	----	----	----
Lansing, S. B. of H.	C.	93	8	8	13	6	2	3	28	12	13	93	11	7	16	7	15	7	10	14	6	90	13	5	11	15	15	5	8	10	8
Swartz Creek	C.	93	0	4	21	1	13	4	33	7	10	93	1	1	19	1	17	7	27	2	18	------	------	----	----	----	----	--	----	----	----
Otsego	S. W.	92	0	0	3	7	1	19	14	42	6	93	0	2	2	11	21	18	9	25	5	82	0	6	3	6	11	16	14	20	6
Ann Arbor	S. C.	91	0	8	9	11	10	13	17	9	14	93	0	16	11	16	11	14	7	6	12	90	2	12	16	20	12	7	4	11	6
Battle Creek	S. C.	93	0	1	6	1	18	8	30	12	17	93	2	3	4	1	25	11	6	19	22	90	1	4	1	3	28	14	11	14	14
Kalamazoo	S. C.	93	4	13	8	4	4	18	13	21	8	93	5	11	4	14	9	19	10	9	12	90	5	13	7	19	8	18	7	9	4
Marshall	S. C.	93	18	6	15	1	5	10	25	4	9	93	22	3	22	7	9	3	17	5	5	90	9	2	21	11	22	0	12	4	9
Birmingham	S. E.	84	20	8	13	2	1	3	13	13	11	89	21	9	16	1	2	3	5	10	22	69	15	3	13	12	1	1	14	7	3
Detroit	S. E.	93	1	8	19	9	12	4	23	9	8	93	0	13	13	22	14	5	12	8	6	90	1	4	19	17	18	1	8	10	12

*‡ For these references see foot notes to this table on page 67.

NOTE.—Graphic representations of statements for 14 lines in this table are given in Diagram XII., page 66, which is explained on page 64.

TABLE XIV.—CONCLUDED.—*Direction of Wind, Months in 1887.—Observations at which the Wind was Blowing from Directions Named.*

Stations in Michigan.* (Those of U. S. Signal Service in Italics.)	Divisions of the State.*	October.										November.										December.									
		Total.	Calm.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.	Total.	Calm.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.	Total.	Calm.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.
Av. for 17 Stations‡	....	92	3	7	3	2	7	12	21	18	21	90	3	7	9	6	8	11	17	13	16	93	2	5	6	7	15	12	21	12	12
Ripley	U. P.	......	......	....	....	....	....	..	....	....	....	......	......	....	....	....	....	..	....	....	....	......	......	....	....	....	....	..	....	....	....
Marquette	U. P.	93	1	13	3	6	0	11	9	17	33	90	0	9	6	1	4	12	12	17	29	93	0	4	8	6	12	12	14	11	26
Gulliver Lake	U. P.	93	6	6	3	5	7	24	12	13	17	90	3	12	6	6	7	16	9	4	27	93	5	4	12	11	11	16	12	2	20
Escanaba	U. P.	93	1	19	4	1	6	5	28	7	22	90	2	30	12	2	1	7	16	6	14	93	3	18	17	6	6	3	24	6	10
Traverse City	N. W.	93	6	12	2	1	3	19	23	11	16	90	9	13	12	0	10	11	21	3	11	93	10	9	8	1	13	25	15	4	8
Mackinaw City	N.	93	3	6	3	7	5	15	15	12	27	90	1	11	7	8	13	6	17	9	18	93	2	9	9	14	14	10	13	5	17
Alpena	N. E.	93	1	4	0	5	10	11	16	36	10	90	1	6	4	10	10	10	12	17	20	93	1	6	5	8	15	13	14	18	13
Harrisville	N. E.	93	0	1	4	0	9	4	41	8	26	90	0	0	11	0	16	5	29	1	28	93	0	0	5	0	26	3	38	0	21
Grand Haven	W.	93	0	8	4	5	16	17	8	9	26	90	0	4	12	17	5	11	12	10	19	93	0	7	5	13	20	7	21	9	11
Port Austin	B. & E.	93	4	8	6	1	6	4	33	9	22	88	3	24	8	1	7	6	24	6	9	92	5	5	11	1	12	2	46	10	0
Port Huron	B. & E.	93	0	4	4	1	5	13	32	16	18	90	0	2	9	6	8	14	15	18	18	93	0	2	4	6	15	20	21	7	18
Thornville	B. & E.	93	4	0	3	1	14	2	18	30	21	90	2	0	9	11	17	5	17	12	17	93	0	0	7	6	23	1	23	19	14
Ag'l College	C.	93	12	4	2	4	3	9	25	19	15	90	7	3	10	4	5	14	27	18	2	92	0	2	4	5	13	26	22	15	5
Ionia	C.	......	......	....	....	....	....	..	....	....	....	84	0	18	10	8	4	1	28	12	3	90	0	7	15	7	10	5	25	11	10
Lansing, S.B. of H.	C.	93	1	4	1	1	9	13	21	16	27	90	0	1	10	7	11	14	21	8	18	93	11	0	8	5	22	4	21	9	13
Swartz Creek	C.	......	......	....	....	....	....	..	....	....	....	......	......	....	....	....	....	..	....	....	....	......	......	....	....	....	....	..	....	....	....
Otsego	S. W.	83	0	5	0	0	6	13	17	33	9	90	0	0	1	14	5	15	13	35	7	92	0	0	1	2	20	23	23	19	4
Ann Arbor	S. C.	93	0	8	0	0	7	18	23	22	15	90	4	7	7	3	10	12	15	20	12	93	0	4	4	8	12	7	30	15	13
Battle Creek	S. C.	93	3	3	3	0	9	11	19	21	24	90	1	3	4	9	8	18	13	19	15	92	0	5	1	1	15	36	15	12	7
Kalamazoo	S. C.	93	3	5	1	3	5	26	10	25	15	90	3	11	4	4	2	32	6	20	8	93	0	5	8	10	8	22	18	15	7
Marshall	S. C.	93	12	2	5	0	14	11	17	7	25	90	11	1	12	4	15	7	21	1	18	93	6	0	8	8	15	12	22	12	10
Birmingham	S. E.	91	6	2	1	0	2	11	26	18	25	89	8	6	10	4	3	7	20	16	15	91	7	4	6	5	14	14	23	10	8
Detroit	S. E.	93	0	17	7	0	2	2	26	14	25	90	0	16	9	8	4	4	23	15	11	93	0	9	3	8	8	7	19	26	13

*, ‡. For these references see foot-note to this table on page 67.

NOTE.—Diagram XII, page 66, exhibits lines showing, by months, directions of wind at each of 14 stations in this table, the cut for each month and station in said diagram representing the figures given in this table for the same month and station; it is explained on page 64.

TABLE XV.—*Average Daily Range of Atmospheric Pressure (as determined from three daily observations*) for the Year 1887, at each of 16 Stations, and the average for the same Stations in Michigan.—Stations arranged in order by Latitude, those farthest North first.*

Stations in Michigan.† (Those of the U. S. Signal Service in Italics.)	Average Daily Range of Barometer—Year and Months, 1887.														
	Norm. ‡	1886.	1887.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 16 stations	......	.....	.216	.342	.415	.251	.226	.122	.117	.111	.110	.174	.218	.255	.248
Av. for 15 stations§.......	......	.....	.217	.344	.417	.254	.228	.123	.118	.113	.111	.176	.219	.257	.250
Marquette	.219^{2}	.211	.227	.317	.381	.249	.247	.151	.111	.134	.115	.220	.235	.291	.269
Escanaba.................	.222^{6}	.209	.222	.320	.379	.242	.247	.138	.114	.125	.108	.205	.235	.296	.257
Mackinaw City	.222^{4}	.211	.231	.350	.416	.260	.256	.128	.118	.127	.110	.207	.241	.302	.251
Alpena....................	.225^{5}	.213	.231	.362	.433	.271	.252	.117	.127	.129	.103	.196	.241	.290	.252
Traverse City.............	.220^{6}	.209	.222	.355	.409	.246	.238	.132	.117	.112	.121	.188	.224	.268	.248
Harrisville................	.231^{3}	.226	.239	.374	.436	.269	.243	.129	.137	.141	.120	.198	.257	.289	.279
Grand Haven.............	.207^{6}	.199	.211	.334	.404	.238	.217	.132	.117	.102	.109	.170	.224	.251	.235
Port Huron...............	.215^{5}	.201	.220	.359	.436	.258	.225	.113	.144	.110	.105	.161	.209	.253	.264
Thornville.................	.208^{4}	.201	.216	.353	.426	.293	.217	.118	.142	.105	.107	.151	.209	.238	.238
Agr'l College.............	.203^{5}	.198	.207	.363	.411	.233	.208	.127	.105	.096	.104	.154	.204	.216	.259
Lansing, S. B. of H.......	.205^{6}	.193	.204	.336	.409	.243	.215	.115	.114	.103	.107	.160	.195	.221	.230
Birmingham...............	......	.....	.213	.331	.467	.238	.225	.110	.111	.117	.116	.159	.196	.236	.244
Detroit....................	.211^{5}	.197	.211	.352	.423	.250	.223	.107	.114	.104	.101	.152	.202	.245	.254
Ann Arbor.................	.206^{6}	.199	.210	.341	.413	.277	.211	.112	.113	.092	.125	.164	.206	.233	.237
Marshall....................	.208^{5}	.198	.199	.320	.411	.237	.200	.117	.091	.093	.110	.151	.207	.227	.229
Kalamazoo.................	.184^{3}	.176	.190	.300	.387	.216	.193	.107	.099	.089	.096	.151	.196	.226	.221

---

* At stations of the U. S. Signal Service the observations were made at 7 A. M., 3 P. M., and 10 P. M., 75th Meridian time. The corresponding local time for each of these stations is stated in star (*) footnote to Table I., page 19.

† The names of observers, their places of observation, and the counties in which these places are situated. are stated in Exhibit 1, page 2. The average atmospheric pressure at each of these stations, by months, in 1887, is given in Table XVII., page 76.

‡ Numbers in this column state the average daily range of atmospheric pressure for periods of years ending in each case with Dec. 31, 1887. The small figures above and at the right of numbers which state the average daily range, denote the number of years included in the average.

§ Not including Kalamazoo.

NOTE.—The latitude and elevation of some of these stations are stated in Exhibit 2, page 3.

TABLE XVI.—*Range of Atmospheric Pressure (as determined from 3 daily observations*) for the year and for each month and for the average month of the year 1887, at 16 and at each of the 16 Stations† in Michigan; also the Norm.—Average Monthly Range for a series of years.—Stations named in order by Latitude, those farthest North first.*

Stations in Michigan.‡ (Those of the U. S. Signal Service in Italics.)	Range of Barometer.—Year and Months, 1887.															
	Norm. ††	1886.	1887.	Av. Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
For 16 Stations¶	......	......	2.192	1.507	1.689	2.073	1.761	1.638	1.126	1.278	.976	.997	1 226	1.356	2.108	1.857
Av. for 16 Stations‖	......	......	1.725	1.056	1.292	1.643	1.253	1.216	.724	.775	.543	.529	.832	1.003	1.591	1.264
Av. for 15 Stations**	......	......	1.731	1.062	1.302	1.646	1.260	1.224	.731	.782	.549	.531	.836	1.006	1.599	1 273
Marquette	^{9}1.034	1.644	1.706	1.095	1.334	1.578	1.282	1.234	.940	.800	.610	.490	.960	1.130	1.680	1.098
Escanaba	^{6}.996	1.600	1.814	1.082	1.450	1.633	1.244	1.324	.800	.780	.560	.470	.950	1.070	1.499	1.200
Mackinaw City	^{4}1.017	1.672	1.916	1.137	1.475	1.737	1.259	1.393	.760	.810	.610	.510	1.020	1.140	1.690	1.240
Alpena	^{5}1.032	1.594	1.906	1.157	1.504	1.766	1.289	1.379	.740	.840	.650	.530	.970	1.160	1.640	1.410
Traverse City	^{6}1.002	1.586	1.889	1.127	1.396	1.734	1.263	1.332	.790	.787	.507	.595	.895	1.053	1.660	1.516
Harrisville	^{3}1.033	1.547	1.830	1.131	1.443	1.728	1.284	1.233	.774	.850	.648	.544	.928	1.119	1.622	1.396
Grand Haven	^{6}.941	1.530	1.699	1.043	1.207	1.655	1.215	1.228	.670	.730	.460	.490	.860	1.080	1.633	1.290
Port Huron	^{5}.986	1.443	1.814	1.079	1.251	1.754	1.337	1.233	.760	.790	.560	.560	.780	.960	1.600	1.360
Thornville	^{4}.970	1.457	1.632	1.036	1.194	1.601	1.190	1.200	.690	.905	.547	.522	.850	.904	1.584	1.245
Agr'l College	^{5}.922	1.480	1.608	1.005	1.323	1.518	1.222	1.107	.610	.756	.505	.534	.747	.995	1.531	1.213
Lansing, S. B. of H.	^{6}.927	1.446	1.624	1.012	1.173	1.597	1.251	1.122	.681	.764	.525	.532	.739	.969	1.559	1.227
Birmingham	......	......	1.645	1.011	1.225	1.607	1.303	1.180	.670	.758	.537	.519	.678	.848	1.588	1.213
Detroit	^{5}.945	1.468	1.638	1.025	1.190	1.580	1.339	1.185	.670	.750	.520	.550	.750	.900	1.600	1.260
Ann Arbor	^{6}.923	1.430	1.589	1.013	1.189	1.557	1.224	1.151	.720	.740	.510	.656	.708	.912	1.568	1.225
Marshall	^{5}.918	1.525	1.651	.972	1.171	1.639	1.199	1.064	.686	.663	.493	.469	.710	.851	1.527	1.195
Kalamazoo	^{3}.892	1.463	1.641	.964	1.147	1.606	1.150	1.088	.619	.682	.440	.492	.771	.960	1.477	1.136

¶ Represents the difference between the highest of 16 stations and lowest of 16 stations for year and for each month of year.

‖ Represents sum of ranges at 16 stations divided by 16.

**** Not including Kalamazoo.**

†† Numbers in this column state the average monthly range of atmospheric pressure for a period of years ending in each case with Dec. 31, 1887. The small figures above and at the right of numbers which state the average, denote the number of years included in the average.

NOTE.—The *, †, ‡ references and the note to Table XV., page 71, apply also to Table XVI.

EXHIBIT 29.—*Average atmospheric pressure, by year and months, in 1887, compared with annual and monthly averages for 1886, and for the ten years, 1877–86. These averages are for groups of several stations in Michigan.**

Years, etc.	Average Atmospheric Pressure.– Inches of Mercury.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 10 years, 1877-86*....	29.158	29.203	29.190	29.143	29.124	29.124	29.106	29.113	29.143	29.187	29.202	29.173	29.181
1886 (15 stations*). ..	29.192	29.188	29.198	29.126	29.230	29.128	29.161	29.159	29.166	29.222	29.331	29.137	29.262
1887 (15 stations)......	29.215	29.118	29 810	29.250	29.152	29.294	29.203	29.188	29.234	29.305	29.185	29.211	29.218
In 1887 Greater than Av. for 10 y'rs., 1877–86.....	.057	......	.120	.007	.028	.080	.097	.075	.091	.118	......	.038	.037
In 1887 Less than Av. for 10 y'rs, 1887-86.........	......	.085	......	......	......	......	......	......	......	......	.017	......	......
In 1887 Greater than in 1886	.023	......	.112	.124	......	.076	.042	.029	.068	.083	......	.074	......
In 1887 Less than in 1886.	......	.070	......	......	.078	......	......	......	......	......	.146	......	.044

* Kalamazoo for 1877-82 and 1885-6; Battle Creek for 1877-80 and 1882; Detroit for 1878,86; Woodmere Cemetery (near Detroit) for 1877-9; Mendon for 1877-8 and 1881-3; Marquette for 1879-84 and 1886; Alpena, Grand Haven, Port Huron, Lansing for 1879-86; Benton Harbor for 1877–8; Ypsilanti for 1877 and 1879; Agricultural College for 1877–86; Otisville for 1878-80 and 1882; Tecumseh for 1879-80 and 1882-5; Washington for 1879–80 and 1882-3; Nirvana for 1879 and in 1880 to April 25, inclusive; Reed City, for 1880 after April 25, and 1881-5; Thornville for 1880-1 and 1884-6; Escanaba for 1880 and 1882-6; Ann Arbor for 1881-6; Traverse City for 1882-6; Harrisville for 1882 and 1885-6; Hastings for 1882; Hillsdale for 1882-3; Port Austin for 1883-4; Marshall for 1883-6; Manistique, Ionia for 1884-5; Mackinaw City 1884-6; Swartz Creek for 1885.

EXHIBIT 30.—*Comparisons of the Average Atmospheric Pressure during the Year and during each Month of the Year 1887, with Averages for the 12 Years, 1875-86, and for the Year 1886. Corrected for Temperature and for Instrumental Error. Observations made at 7 A. M., 2 P. M., and 9 P. M., daily, by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Mich.*

Years, Etc.	Average Atmospheric Pressure.—Inches of Mercury.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 12 yrs., 1875-86	29.061	29.083	29.064	29.010	29.021	29.036	29.034	29.050	29.068	29.107	29.089	29.077	29.087
1886..........	29.089	29.061	29.093	29.000	29.113	29.023	29.055	29.051	29.049	29.135	29.253	29.061	29.173
1887..........	29.092	28.987	29.163	29.105	29.035	29.083	29.094	29.091	29.104	29.187	29.090	29.063	29.083
In 1887 **Greater** than av. for 12 yrs., 1875-86......	.031	......	.099	.095	.014	.047	.060	.041	.036	.080	.001	.006	......
In 1887 **Less** than av. for 12 yrs., 1875-86..........	......	.096	......	......	......	......	......	......	......	......	......	......	.004
In 1887 **Greater** than in 1886..........	.003	......	.070	.105	......	.060	.039	.040	.055	.052	......	.022	......
In 1887 **Less** than in 1886	......	.074	......	......	.078	......	......	......	......	......	.163	......	.090

EXHIBIT 31.—*Average Daily Range of Atmospheric Pressure by year and months, in 1887, compared with Annual and Monthly Averages for 1886, and for the five years, 1882-86. These Averages are for Groups of several Stations in Michigan.*

Years, Etc.	Average Daily Range of Barometer.—Year and Months, 1887.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 5 yrs., 1882-86*	.212	.314	.299	.288	.199	.168	.146	.122	.137	.162	.208	.236	.261
1886 (14 stations*)....	.205	.270	.324	.248	.166	.157	.131	.112	.142	.187	.229	.269	.220
1887 (15 stations).....	.217	.344	.417	.254	.228	.123	.118	.113	.111	.176	.219	.257	.250
In 1887 **Greater** than Av. for 5 yrs., 1882-86..............	.005	.030	.118	......	.029	......	......	......	......	.014	.011	.021	......
In 1887 **Less** than Av. for 5 years, 1882-86..............	......	......	......	.034	......	.045	.028	.009	.026	......	......	......	.011
In 1887 **Greater** than in 1886.........	.012	.074	.093	.006	.062	......	......	.001	......	......	......	......	.030
In 1887 **Less** than in 1886..............	......	......	......	......	......	.034	.013	......	.031	.011	.010	.012	......

* Marquette for 1882-4 and 1886; Escanaba, Traverse City, Grand Haven, Lansing, Ann Arbor for 1882-6; Reed City, Tecumseh for 1882-5; Alpena, Port Huron, Agricultural College, Detroit, Marshall for 1883-6; Port Austin for 1883-4; Washington for 1883; Mendon for 1883; Manistique, Ionia, for 1884-5; Mackinaw City, Thornville, for 1884-6; Harrisville for 1885-6; Swartz Creek for 1885.

EXHIBIT 32.—*Range of Atmospheric Pressure, by Year and Months, in 1887, compared with Annual and Monthly Averages for 1886, and for the five years 1882–86. These Averages are for Groups of Several Stations in Michigan.*

Years, Etc.	Range of Barometer.—Year and Months, 1887.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 5 yrs., 1882–86*...	.932	1.187	1.205	1.196	1.034	.761	.702	.563	.648	.821	1.014	1.004	1.123
1886 (14 stations*)......	.941	1.013	1.320	1.339	1.103	.728	.600	.506	.597	.717	1.406	1.213	1.108
1887 (15 stations)......	1.062	1.302	1.646	1.260	1.224	.731	.782	.549	.531	.836	1.006	1.599	1.273
In 1887 **Greater** than Av. for 5 yrs., 1882–86...............	.130	.115	.441	.064	.190	......	.080	......	......	.015	......	.595	.150
In 1887 **Less** than Av. for 5 years, 1882–86...............	......	......	......	......	......	.030	......	.014	.117	......	.008	......	......
In 1887 **Greater** than in 1886..........	.121	.289	.326	......	.121	.003	.182	.043	......	.119	......	.386	.165
In 1887 **Less** than in 1886.................	......	......	......	.079	......	......	......	......	.066	......	.400	......	......

*** Marquette for 1882–4 and 1886; Escanaba, Traverse City, Grand Haven, Lansing, Ann Arbor for 1882–6; Reed City, Tecumseh for 1882-5; Alpena, Port Huron, Agricultural College, Detroit for 1883–6; Port Austin for 1883–4; Washington, Mendon for 1883; Marshall for 1883-5; Manistique, Ionia for 1884–5; Mackinaw City, Thornville for 1884–6; Harrisville for 1885–6; Swartz Creek for 1885.**

TABLE XVII.—*Average Atmospheric Pressure for the Year, and for each Month in the Year 1887, at each of 16 Stations in Michigan, and also the Average for the same Stations, as indicated by the height, in inches, of Mercury in the Barometer. Corrected for Temperature.—Reduced to 32° F. (for some Stations not corrected for Instrumental Errors*).—Average of Observations made Daily at 7 A. M., 2 P. M., and 9 P. M.,† by Observers‡ for the State Board of Health and for the U. S. Signal Service.*

Stations in Michigan.‡ (Those of the U. S. Signal Service in Italics.)	Divisions of the State.‡	Inches of Mercury.—Atmospheric Pressure.													
		Years.		Months, 1887.											
		Norm.§	1887.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 16 Stations ‖	....	....	29.203	29.105	29.279	29.238	29.140	29.191	29.190	29.176	29 220	29.292	29.175	29.200	29.206
Av. for 15 Stations ¶	....	....	29.215	29.118	29.310	29.250	29.152	29.204	29.203	29.188	29.234	29.305	29.185	29.211	29.218
*Marquette**	U. P.	29.263 ^{2}	29.268	29.183	29.386	29.361	29.178	29.230	29.238	29.219	29.299	29.350	29.233	29.269	29.269
Gulliver Lake	U. P.	....	**	29.211	....	....	....	....	29.275	29.256	29.317	29.389	29.250	29.295	29.305
*Escanaba**	U. P.	29.327 ^{6}	29 341	29.258	^{d}29.458	29.429	29.257	29.315	29.319	29.296	29.362	29.418	29.305	29.340	29.331
Traverse City	N. W.	29.336 ^{6}	29.332	29.251	29.436	29.407	29.264	29.330	29.325	29.324	29.367	29.399	29.300	29 311	29.269
*Mackinaw City**	N.	29.326 ^{4}	29.343	29.235	29.445	29.404	29.264	29.333	29.330	29.301	29.375	^{b}29.444	29.305	29.333	29.349
*Alpena**	N. E.	29.354 ^{15}	29.345	29.234	29.444	29.386	29.282	29.345	29.343	29.311	29.371	29.438	29.307	29.331	29.352
Harrisville	N. E.	29.302 ^{3}	29.331	29.223	29.460	29.365	29.266	29.326	29.329	29.292	29.347	29.416	29.303	29 316	29.329
*Grand Haven**	W.	29.339 ^{15}	29 334	29.235	29.417	29.379	29.263	29.309	29.310	29.302	29.350	29.432	29.346	29.339	29.323
Port Austin	B. & E.	....	††	....	....	....	....	....	29.370	29.308	29.370	^{b}29.425	^{c}29.355	^{b}29.341	29.325
*Port Huron**	B. & E.	29.324 ^{9}	29.333	29.236	29.426	29.343	29.276	29.325	29.313	29.287	29.326	29.414	29.334	29.345	29.370
Thornville	B. & E.	28.956 ^{5}	28.947	28.822	29.021	28.956	28.890	28.949	28.947	28.935	28.966	29.047	28.941	28.934	28.951
Agricultural College*	C.	29.089 ^{6}	29.092	28.987	29.163	29.105	29 035	29.083	29.094	29.091	29.104	29.187	29.090	29.083	29.083
Ionia	C.	....	‡‡	29.056	29.238	29.157	29.111	29.154	^{b}29.174	....	....	....	....	^{d}29.224	^{a}29.158
Lansing, S. B. of H.	C.	29.045 ^{9}	29.077	28.966	29.156	29.092	29.010	29.066	29.072	29.060	29.095	29.182	29.077	29.067	29.085
Swartz Creek	C.	....	§§	29.068	29.270	29.190	29.115	29.163	29.158	29.144	29.180	....	....	....	....
Ann Arbor	S. C.	29.035 ^{7}	29.032	28.928	29.116	29.036	28.974	29.023	29.018	^{e}29.023	29.042	29.122	29.036	29.023	29.039
Battle Creek	S. C.	....	‖‖	^{b}28.989	....	29.159	^{c}29.088	^{a}29.096	29.070	29.077	29.105	29.187	29.119	29.092	29.114
Kalamazoo*	S. C.	29.034 ^{11}	29.019	28.920	29.092	29.044	28.961	29 004	28.991	28.989	29.024	29.108	29.037	29.028	29.030
Marshall	S. C.	29.031 ^{5}	29.036	28.938	29.108	29.050	28.975	29.014	29.009	29.020	29 063	29.125	29.047	29.040	29.037
Birmingham	S. E.	....	29.090	^{a}29.037	^{f}29.196	^{d}29.118	29.079	^{a}29.102	^{d}29.098	^{b}29.082	^{a}29.113	^{f}29.186	^{a}28.814	29.112	29.137
*Detroit**	S. E.	29.318 ^{15}	29.322	29.233	29.416	29.325	29.266	29.308	29.300	29.282	29.323	29.409	29.330	29.327	29.341

NOTE.—Computations of monthly averages for the year 1887 were furnished by the observers at Marquette, Nov. and Dec. excepted, Escanaba, Mackinaw City, Alpena, Grand Haven. Port Huron, Detroit, and Ann Arbor. The remainder of the computations were made at the office of the State Board of Health.

*For stations marked thus * a correction has been made for instrumental error, as follows: For Marquette, .003 added for Jan., Feb. to July, .002, .004 for Aug. to Dec.; for Escanaba, .017 added; for Mackinaw City, .006 added; for Alpena, .006 added; for Grand Haven, .013 added; for Port Huron, .005 added for months Jan. to Sept. inclusive, and for Oct. to Dec., .009 added; for Detroit, .017 added; for Agricultural College, .013 subtracted; for Kalamazoo, .049 subtracted. For other stations the instrumental error of barometer is not known.

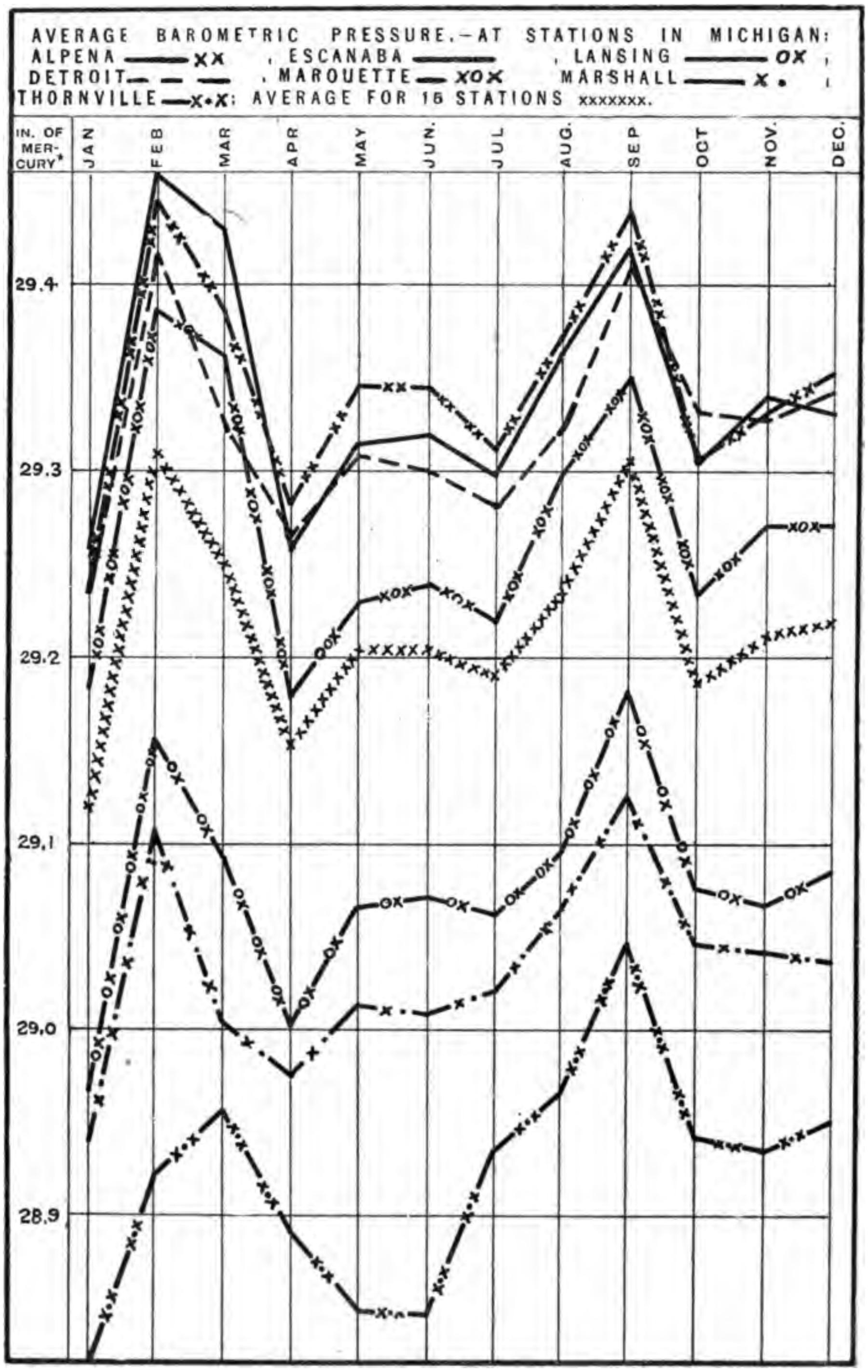
†At the stations of the U. S. Signal Service for the year 1887, the observations were made at 7 A. M., 3 P. M., and 10 P. M., 75th meridian time. The corresponding local time for each of these stations is stated in the star (*) foot note to Table I., page 19.

‡The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1, page 2. The full names of divisions, and the counties in each division, are stated in Exhibit I., in a paper which follows on weekly reports of sickness.

§ Numbers in this column state the average annual atmospheric pressure for a period of years ending in each case with Dec. 31, 1887. The small figures at the right of the numbers which state the average, denote the number of years included in the average. ¶ Not including Gulliver Lake, Ionia, Swartz Creek, Kalamazoo, Battle Creek and Port Austin.

‖This line is an average for 16 stations. It does not include Port Austin, Gulliver Lake, Ionia, Swartz Creek, Battle Creek and Birmingham. Green's standard barometer was used at all the 16 stations except Kalamazoo for 1887. The barometer at Kalamazoo was manufactured by J. Foster, Cincinnati, Ohio. ** The average for 8 months in 1887 is 29.287. †† The average for 7 months is 29.356. ‡‡ For 8 months, 29.159. §§ For 8 months, 29.161. ‖‖ For 11 months, 29.100. ^{a} For 30 days. ^{b} For 29 days. ^{c} For 28 days. ^{d} For 27 days. ^{e} For 26 days. ^{f} For 25 days. The lines for 7 stations in this Table are graphically represented in Diagram XV., page 77.

DIAGRAM XV.—ATMOSPHERIC PRESSURE, BY MONTHS, IN 1887.



*SCALE ONE TENTH INCH OF MERCURY TO ONE IN. VERTICALLY.
H B. T., DEL DES. BY H. B. B.

THE TIME OF GREATEST PREVALENCE OF EACH DISEASE.

CONTRIBUTIONS TO THE STUDY OF THE CAUSES OF SICKNESS.

A STATISTICAL REPORT BASED ON WEEKLY REPORTS OF SICKNESS IN MICHIGAN DURING THE YEAR 1887, AND PRECEDING YEARS.

BY THE SECRETARY OF THE STATE BOARD OF HEALTH.

This paper is the eleventh in a series of articles upon the same general subject, begun in the latter part of 1876. It presents a summary of the compilation of weekly reports of sickness in Michigan in 1887. It includes a series of diagrams or graphic illustrations which show by months in 1887 the rise and fall of twenty-seven of the most prominent diseases in Michigan.

Propositions are stated as to the relations of specified meteorological conditions, and diseases are mentioned under these propositions in such manner as to suggest one method of studying some of the facts brought out in the compilation.

Tables are given showing the per cent of the weekly *reports* which stated the presence of the various diseases, first (in Exhibit IV.), for each of the years 1877–1887, and an average for 1877–1886; and secondly (in Exhibit IV. continued), by months, in the year 1887, in each of the years 1885–6, and the average for the period of years 1877–86, the diseases being arranged in the order of their greatest reported prevalence in 1887, to facilitate a comparison with the prevalence of the same diseases in previous years, and in corresponding months in previous years.

The per cent of *observers* stating the presence of each of the diseases is given in Table 1, for the year 1887, and, for comparison, for each of the years 1877–1887, and, in Table 1 continued, for the months in the year 1887, and, for comparison by months in each of the years 1884, 5 and 6, and the average for the period 1877–86.

Comparing Table 1 with Exhibit IV., we see the correspondence in the two lines of evidence,—that of the "prevalence" of the diseases as shown by the per cent of *reports*, and the "area of prevalence" as shown by the per cent of *observers*, the diseases following each other in a somewhat similar order from highest to lowest—the diseases being arranged in the table, as in the exhibit, in the order of their greatest reported prevalence in 1887.

One of the objects of this compilation is to learn the time of the greatest and of the least prevalence of the more important diseases in the State, and to note the connection of this prevalence with each of the meteorological conditions in the State. Casual observation shows that certain diseases are much more prevalent in the hot months, while certain other diseases are much more prevalent in the cold months. The relation between these diseases and the atmospheric temperature is well marked, but accurate statistics are needed to show just what that relation is. We find, also, that other meteorological conditions than atmospheric temperature have a marked effect upon many of the diseases, apparently diminishing the effect of temperature in some instances, increasing its effect in other instances. For this reason the State Board of Health undertakes by a compilation of the weekly reports of sickness in connection with the various meteorological conditions, to learn what causal relations exist between the humidity of the air, the ozone, the velocity of the wind, the atmospheric pressure, etc., and the increased or diminished prevalence of diseases in certain months as compared with other months in the same year, or with the same months in other years or series of years.

Since 1876, when this system of "weekly reports of diseases" was begun, an important work has been accomplished in learning the time of the greatest prevalence of each of several of the most important diseases, and consequently the time of greatest danger from each such disease in the State considered as a unit. To facilitate the study of the causes of sickness and deaths the State is divided into eleven geographical divisions, a list of which, and the counties embraced in each, appear in Exhibit I., page 85. From some of these divisions sufficient data are not yet received to make the study of the comparative prevalence of diseases in different parts of the State practicable. The number of reports from localities in the newer parts of the State is increasing, however, and a comparison of sickness by localities may become practicable in the near future.

PHYSICIANS' WEEKLY REPORTS OF SICKNESS.

Weekly reports are now received concerning twenty seven diseases, the names of which are printed on the blank postal used for the weekly report, and concerning these twenty-seven diseases a positive report is made each week by many of the leading physicians in Michigan.

Great credit is due the busy medical practitioners in Michigan who forward these reports of sickness. Some of them have made the reports regularly since this plan was adopted in 1876. The service is, as a rule, without compensation; possibly a few health officers may have slight pay from their local boards of health. No other class of persons, however, has knowledge of the facts that are necessary in the compilation of health statistics; and it is greatly to the credit of physicians that they are so willing to coöperate in every effort made to advance the public health.

PLAN OF THE WEEKLY CARD-REPORTS.

The plan of the weekly reports remains the same as last year. Observers now report only the diseases under their own personal observation. Previous to the year 1885, some of the observers reported such diseases as they believed to be present in their locality, even though not under their own observation. The change in method of making the reports may account partially for the apparent decrease in sickness in 1887, when compared with the average for the ten years, 1877–86. Details of the method of securing and the plan of marking these reports may be thus stated:—

The blanks for the weekly reports are printed on postal cards, which are supplied to the observers of diseases. Blank record books in which to preserve copies of the reports, remarks, etc., are also supplied to these observers, to be retained by them. The reports are forwarded weekly to the Secretary of the State Board of Health, at Lansing.

The plan of making the report is as follows: Each observer is requested to mark the disease of which there was the greatest number of cases under his observation during the week for which the report is made, 1; that of which there was the next greatest number of cases, 2; the next, 3; and so on, applying *consecutive* numbers to the diseases reported present; but marking with the *same* figure all diseases of which there is the same number of cases; to write 0 opposite each disease mentioned of which there was no case; to apply these numbers without regard to the severity of the cases; to include all cases, without regard to when they were taken sick, so long as they are actually sick with the given disease; to include all cases "under the observation" of the observer. A blank is left on the card for the convenience of those observers who prefer to state the number of cases rather than the order of prevalence by the foregoing method.

To illustrate the method of making the reports, the following copy of one of the blanks now in use is given, correctly marked, in the "prevalence" column, for the number of cases stated on the right-hand margin. It should be remembered that the numbers in the "prevalence" column denote simply the relative order in which the several diseases appear to be prevalent, and do not denote a definite number of cases; so that a disease might one week be marked *4*, and the following week, with the same number of cases, be marked *1*. Names of diseases and figures printed in italics are not ***printed*** on the postal blanks, but are supposed to have been *written* on the report by the observer.

Diseases in................................[and vicinity?]

☞ PLEASE DATE. ☜

week ending Sat................................., *188*...

No........

ED 26.

	Prevalence. Order. See a.	*Cases.*
Brain, Inflammation of.....	*14*	*1*
Bowels, Inflammation of....	*12*	*3*
Bronchitis.....................	*11*	*4*
Cerebro-spinal Meningitis.	*0*	*0*
Cholera Infantum..............	*8*	*9*
Cholera Morbus................	*10*	*6*
Consumption, Pulmonary..	*10*	*6*
Croup, Membranous..........	*12*	*3*
Diphtheria.......................	*5*	*14*
Diarrhea.........................	*3*	*17*
Dysentery.......................	*8*	*9*
Erysipelas.......................	*13*	*2*
Fever, Intermittent..........	*2*	*21*
Fever, Remittent.............	*11*	*4*
Fever, Typhoid (Enteric)..	*0*	*0*
Fever, Typho-malarial......	*9*	*7*
Influenza........................	*7*	*11*
Kidney, Inflammation of....	*14*	*1*
Measles..........................	*1*	*27*
Neuralgia........................	*14*	*1*
Pneumonia......................	*9*	*7*
Puerperal Fever..............	*0*	*0*
Rheumatism....................	*6*	*12*
Scarlatina.......................	*4*	*16*
Small-pox.......................	*0*	*0*
Tonsilitis........................	*11*	*4*
Whooping-cough..............	*0*	*0*
Mumps.........................	*6*	*12*
Dyspepsia.....................	*11*	*4*
....	....	......
....	....	......

a. Please mark the disease of which there is the greatest number of cases, 1; the disease having next greatest number of cases, 2; the next, 3; and so on for each disease, writing the same figures opposite diseases having the same number of cases. Write 0 opposite each disease of which there is no case under your observation. [For full statement of plan, see second, third, and fourth pages of record-book cover.] A blank indicates that the item has been overlooked.

Please mail this, ☞ signed and dated, ☜ as soon as convenient after close of week specified.

☞ This report is of diseases UNDER YOUR OBSERVATION; if it includes a contagious disease, please mention, on the bottom or margin of this card, the township, city, or village in which the disease is.

.... *M. D.*

BULLETINS OF HEALTH IN MICHIGAN.

During the year 1887 the issue of weekly and monthly bulletins of "Health in Michigan" has been continued. The weekly bulletin is compiled from the physicians' weekly reports from all parts of the State. It is designed to give, each week, information to the public concerning the diseases which cause most sickness in the State, the relative amount of sickness compared with the corresponding week in previous years, and compared with the preceding week—thus showing any sudden increase or decrease which may have occurred in the prevalence of any disease, together with a similar comparison of the various meteorological conditions; also, a list of the localities in which each of the dangerous communicable diseases is reported present. A copy of this bulletin has been sent to such editors as have expressed a desire to have it for use, entire or in part in their papers. About thirty copies are now used for this purpose each week. The monthly bulletin is similar in character to the weekly bulletin. It is issued as soon as possible after the close of each month, and it is sent to the sanitary and medical journals which are received as exchanges by the library of the State Board of Health. About seventy copies are thus used at the present time.

As a rule, about one-half of the card reports reach the office of the State Board of Health in time for compilation in the weekly bulletin, and the monthly bulletins are compiled from the information used in the weekly bulletin. It is found that the statements made in the monthly bulletins are corroborated by the information obtained after the close of the year, in the compilation of the whole number of the reports for the corresponding months of the year.

COMPILATION OF THE WEEKLY REPORTS.

The reports from each locality are compiled by months. The average of the numbers stating the order of prevalence of the several diseases for the month is considered an indication of the actual order of prevalence of the diseases for that time. There is also found for each locality what per cent of the reports state the presence of each disease for the given month. This per cent of reports for a single locality indicates what part of the month the disease was present in that locality. It may also be called the per cent of weeks the disease was present. These first results of the compilation are stated in Table 3, which, on account of the space required, has not been printed in the Reports since that of 1882, but is preserved in the office of the State Board for reference and study.

A combination of the statements for localities in Table 3 is made by months for the State, so far as it is represented by the localities from which reports are received showing: (1) What per cent of the observers reported each disease each month; (2) for the localities at which a given disease was reported, an average of the per cent of weeks it was reported at those localities; (3) what per cent of all the reports received for the month stated the presence of each disease; (4) an average of the numbers denoting the order of prevalence of each disease at the localities at which it was reported present during the month.

THE PREVALENCE OF THE SEVERAL DISEASES IN 1887.

By noting the per cent of all the reports received for a given time which stated the presence of each disease, the relative prevalence of the several diseases may be readily seen. This per cent has been computed for each disease, by months for the year 1887. It is thus stated in Exhibit II., page 86, which also states the per cent for each disease for each of the preceding ten years. What per cent of the reports stated the presence of each disease by months in 1887, is graphically represented in Diagrams 1-5, on page 87, and following pages.

For eighteen diseases a comparison has been made of the amount of sickness in 1887 (as indicated by the proportion of reports stating the presence of the disease) with the average amount for a period of ten years. These comparisons are shown in Exhibits XI., XIII., XVIII., and XX. A comparison is made in Tables 1, page 95-8, between the number of observers reporting the tabulated diseases present in each of the years 1877-1887, and by months in a part of those years. In Exhibit IV., on pages 90 and 91, the per cent of reports stating the presence of each of the twenty-seven tabulated diseases for the years 1877-1887, and by months in a part of those years is given. In Table 1. and in Exhibit IV., the diseases are arranged in the order of the greatest per cents for 1887, the highest being placed first.

A study of the reported sickness from twenty-seven diseases, in connection with meteorological conditions by months in 1887, is made in Exhibit X., and following exhibits. By arranging months in order of greatest prevalence of the disease under consideration, noting whether it is more or less prevalent than the average for the year, and noting what were the meteorological conditions for the same months as compared with the average for the year, relations and comparisons are grouped for convenient comparison. A summary of one line of the evidence presented by these exhibits is given in Exhibits XXIV. and XXV.

In Exhibits VI. and VII., on pages 111, and 112, the leading diseases are arranged in order according to the amount of sickness reported from them in 1887, those from which there was most sickness reported being placed first. In these exhibits the diseases are arranged with reference to the per cent of reports taken in connection with the average order of prevalence.

The comparison with former years is facilitated by reference to Exhibit II., page 86, Table 1, pages 95,96 , and 97, Exhibit IV., pages 89, 90, and 91, and Exhibits XI., XIII., XVIII., and XX.

Exhibit IV., on pages 89, 90, and 91, is continued for 1887. In it the diseases are arranged in order of the greatest per cent of reports stating the presence of the diseases in 1887, the highest per cent being placed first in the line. It is similar in form to Table 1, page 95, which shows the per cent of observers by whom diseases were reported present. It affords a means of comparing the diseases showing greatest prevalence with those showing greatest area of prevalence or widest distribution. It affords also a means for the comparison of per cent of reports in 1887 with the average per cent of reports in the ten years 1877-1886, both for the year and by months, also by months in 1887 with several of the years previous to 1887.

In this report, where the per cent of sickness for 1887 is compared with the average for a series of years, that average does not include 1887; this is a change from the plan of former reports, and was made because it more truly shows the annual increase or decrease of any of the tabulated diseases.

DISEASES FROM WHICH THERE WAS A MARKED INCREASE OR LESSENED PREVALENCE IN MICHIGAN IN 1887.

By referring to Exhibits II. and IV., it will be seen that there was no disease which showed a marked increase in 1887 over the average for the ten years 1877–86. The diseases in which the decrease appears most marked are intermittent fever, remittent fever, consumption of the lungs, diphtheria, scarlet fever, pneumonia and influenza.

In Exhibits XI., XIII., XVIII., and XX., the per cent of reports by months in 1887 is placed directly under the per cents for the corresponding months in 1886. A comparison between the corresponding months in the two years is thus made possible, and the comparison of the months in 1887 with the averages for the months in the series of years preceding is made easy by placing the differences, greater or less, in separate lines.

A part of the lessened prevalence of some of the prominent diseases may be due to the change in the method of reporting sickness, referred to on page 80.

EXHIBIT I.—*Eleven Geographical Divisions of the State, formed for the purpose of facilitating the study of Causes of Sickness and of Deaths, with a list of Counties included in each Division.*

1.-Upper Peninsular.	2.-North-western.	3.-Northern.	4.-North-eastern.	5.-Western.	6.-Northern-Central.	7.-Bay and Eastern.	8.-Central.	9.-South-western.	10.-Southern-Central.	11.-South-eastern.
Alger.	Benzie.	Antrim.	Alcona.	Kent.	Clare.	Arenac.	Barry.	Allegan.	Branch.	Macomb.
Baraga.	Gr. Traverse.	Charlevoix.	Alpena.	Lake.	Gladwin.	Bay.	Clinton.	Berrien.	Calhoun.	Monroe.
Chippewa.	Leelanaw.	Cheboygan.	Iosco.	Mason.	Isabella.	Huron.	Eaton.	Cass.	Hillsdale.	Oakland.
Delta.	Manistee.	Crawford.	Montmorency.	Muskegon.	Mecosta.	Lapeer.	Genesee.	Van Buren.	Jackson.	Wayne.
Gogebic.	Manitou.	Emmet.	Ogemaw.	Newaygo.	Midland.	Saginaw.	Gratiot.		Kalamazoo.	
Houghton.	Wexford.	Kalkaska.	Oscoda.	Oceana.	Roscommon.	Sanilac.	Ingham.		Lenawee.	
Iron.		Otsego.	Presque Isle.	Ottawa.	Missaukee.	St. Clair.	Ionia.		St. Joseph.	
Isle Royal.					Osceola.	Tuscola.	Livingston.		Washtenaw.	
Keweenaw.							Montcalm.			
Luce.							Shiawassee.			
Mackinac.										
Marquette.										
Menominee.										
Ontonagon.										
Schoolcraft.										

On pages 230 and 253 of the Report of this Board for 1885, the divisions and the counties in each were indicated by lines on maps of the State. Similar maps appear in the articles on diphtheria and scarlet fever near the end of the present report.

EXHIBIT II.—*Stating for each of 27 Diseases for the ten Years ending Saturday, January 1, 1887, for each of those Years, and by Months of the Year 1887, on what Per Cent of the Reports Received each Disease was stated to be Present.—Compiled from Weekly Reports by Health Officers of Cities and Villages, by Regular Correspondents of the State Board of Health, and by other physicians.**

Diseases.	Average, 1877-86	What Per Cent of the Reports Received Stated the Presence of the Disease.												
		Year 1887.	Months, 1887.											
			Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average †	30	25	26	27	28	26	25	24	27	29	26	25	24	24
Brain, Inflammation of	6	6	9	9	6	5	8	8	7	6	5	5	3	6
Bowels, Inflammation of	15	16	16	16	17	11	16	15	20	21	17	13	11	15
Bronchitis	61	55	67	69	67	62	57	49	41	38	47	57	56	61
Cerebro-spinal Meningitis	5	3	2	3	2	3	5	4	3	4	3	3	3	2
Cholera Infantum	13	13	3	3	2	1	5	13	44	45	21	6	3	2
Cholera Morbus	19	19	4	3	3	4	13	25	59	55	31	10	4	4
Consumption, Pulmonary	64	51	53	54	61	61	54	48	48	47	45	48	47	50
Croup, Membranous	6	4	10	6	4	6	5	2	1	2	2	4	8	6
Diphtheria	22	10	13	11	11	5	6	5	5	6	7	16	19	12
Diarrhea	47	48	28	32	31	32	36	52	82	85	71	46	34	30
Dysentery	19	19	7	8	10	8	11	14	36	55	37	18	7	9
Erysipelas	23	24	23	28	32	29	27	23	17	18	18	21	26	25
Fever, Intermittent	72	48	39	42	48	50	52	52	53	55	53	50	42	39
Fever, Remittent	48	32	29	26	27	30	30	30	31	40	41	42	31	31
Fever, Typhoid (Enteric)	12	10	6	10	4	3	3	4	8	14	22	18	15	11
Fever, Typho-malarial	22	16	10	12	10	10	6	7	13	27	33	30	17	9
Influenza	40	33	47	52	50	43	34	23	13	18	27	28	35	38
Kidney, Inflammation of	22	18	22	22	23	21	20	19	13	12	14	18	16	17
Measles	13	14	11	17	22	22	25	19	15	6	4	5	9	11
Neuralgia	66	67	72	73	76	71	67	66	62	59	65	66	66	65
Pneumonia	37	28	48	51	50	41	34	16	10	8	14	17	28	31
Puerperal Fever	5	6	5	5	7	8	5	7	6	7	7	3	4	5
Rheumatism	69	69	76	74	77	77	71	70	57	61	66	66	69	70
Scarlatina	18	8	11	11	12	10	6	4	3	4	7	9	10	11
Small-pox	1.1	0.02	0	0	0	0	0	0	0	0	0.3	0	0	0
Tonsilitis	49	47	56	59	61	53	46	37	29	31	38	47	54	57
Whooping-cough	20	14	12	15	15	13	16	15	22	18	11	9	10	9
No. of reports received	4,171	4,896	393	379	424	306	367	515	412	507	382	376	474	361

---

* For 1887 the names of observers are stated in Exhibit V., pages 92, 93 and 94.

† This line is an average for such of the tabulated diseases as were reported present in the given month or year.

Statements in this exhibit for months in 1887 are graphically represented in Diagrams 1, 2, 3, 4, 5, opposite this page and on following pages.

DIAGRAM 1.—WEEKLY REPORTS OF SICKNESS IN MICHIGAN, IN 1887.

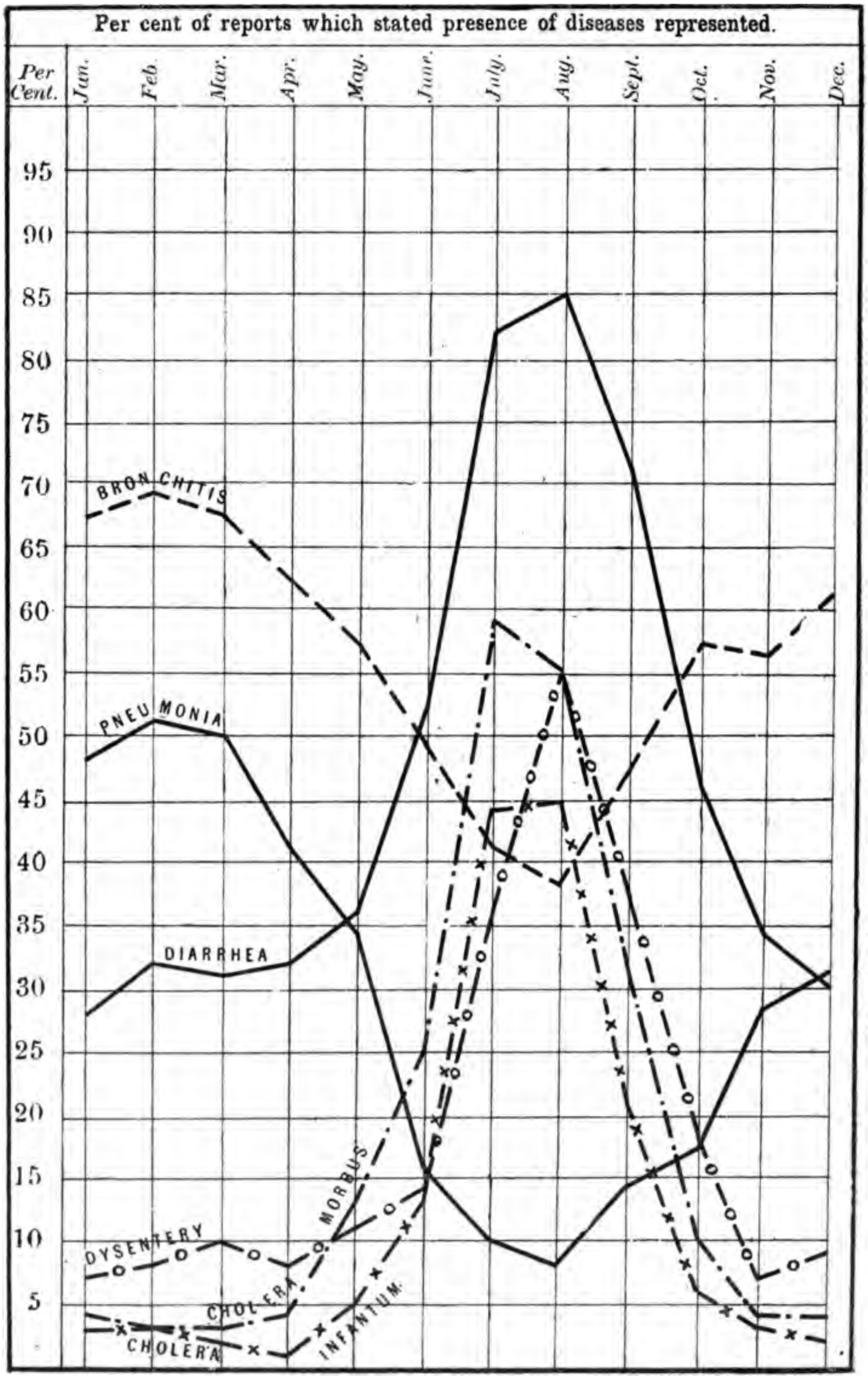


EXHIBIT III.—*Stating, by Months of the Year ending Saturday, December 31, 1887, for the State, and for each of the Eleven Geographical Divisions of Michigan from which Weekly Reports of Diseases were received, the number of Observers from whom the Reports were received; the Number of Reports received; the day on which, for the purposes of this compilation, each month is made to end; and the Number of Weeks thus included in each Month.*

Months, 1887.	Months and Year end Saturday.	Number of weeks.	State.		Divisions of the State.*																					
					1. UpperPeninsular*		2. North-western.*		3. North-ern.*		4. North-eastern.*		5. West-ern.*		6. Northern Central.*		7. Bay and Eastern.*		8. Central.*		9. South-western.*		10. Southern Central.*		11. South-eastern.*	
			Observers.‡	Reports.†	Observers.‡	Reports.†	Observers.‡	Reports.†	Observers.‡	Reports.†	Observers.‡	Reports.†	Observers.‡	Reports.†	Observers.‡	Reports.†	Observers.‡	Reports.†	Observers.‡	Reports.†	Observers.‡	Reports.†	Observers.‡	Reports.†	Observers.‡	Reports.†
Year 1887‡......	Dec. 31, 1887....	52	155	4,896	5	186	3	97	7	183	6	194	11	382	7	228	26	807	27	700	16	508	28	980	19	631
Av. per month.	....	..	100	408	4	16	2	15	4	18	4	16	8	32	5	19	17	67	15	58	10	42	20	82	13	52
January........	Jan. 29..........	4	100	393	3	12	2	8	3	11	3	12	9	35	4	16	18	70	17	67	10	40	20	80	11	42
February......	Feb. 26..........	4	98	379	3	12	2	7	3	9	3	12	8	32	4	16	15	60	18	67	10	40	21	82	11	42
March..........	Apr. 2..........	5	89	424	3	14	1	5	3	12	3	15	8	38	3	15	15	72	14	67	10	45	19	91	10	50
April...........	Apr. 30..........	4	85	306	3	11	2	7	3	7	3	11	7	25	4	14	16	59	11	40	8	30	17	65	11	37
May............	May 28..........	4	100	367	3	11	2	8	3	10	4	15	7	27	5	20	14	52	14	48	14	49	20	78	14	49
June............	July 2..........	5	108	515	5	23	2	10	3	13	5	25	8	40	6	29	17	81	15	70	11	55	22	100	14	69
July............	July 30..........	4	110	412	4	16	2	8	5	18	5	20	8	31	6	24	18	67	16	54	11	42	21	80	14	52
August	Sept. 3..........	5	108	507	4	20	2	10	5	23	4	19	8	40	6	28	19	85	16	76	11	54	20	91	13	61
September.....	Oct. 1..........	4	105	382	4	16	2	8	5	16	4	16	8	26	6	21	16	58	14	49	11	41	22	81	13	50
October........	Oct. 29..........	4	100	376	4	15	2	8	5	20	4	16	8	29	4	15	17	63	15	54	9	35	18	70	14	51
November......	Dec. 3..........	5	97	474	4	20	2	10	5	24	4	19	7	35	4	19	17	81	13	62	9	45	18	89	14	70
December......	Dec. 31..........	4	94	361	4	16	2	8	5	20	4	14	6	24	3	11	16	59	12	46	8	32	19	73	15	58

---

* For counties in each division, see Exhibit I., page 85. † From some of the observers reports were not received for every week, so that the number of reports received does not equal the number of observers multiplied by the number of weeks in the given month or in the year.

‡ In some localities there were more observers than one. The whole number of localities from which reports were received was 127; the average number per month was 87. The names of observers and number of cards received from each observer for each month and for the year are stated in Exhibit V., pages 92, 93, 94.

EXHIBIT IV.—*Stating for each of 27 Diseases for the Ten Years ending Saturday, January 1, 1887, and for each of those years and 1887, on what Per Cent of the Reports received the diseases were stated to be present. Compiled from Weekly Reports by Health Officers of Cities and Villages and by regular Correspondents of the State Board of Health.* (Continued for each month of several of the above mentioned years on pages 90 and 91.)*

Line Number.	Diseases.	What per cent of the Reports stated the Presence of the Disease.											
		Average 1877-86.	1887.	1886.	1885.	1884.	1883.	1882.	1881.	1880.	1879.	1878.	1877.
	Average Disease†	30	25	26	26	29	30	30	33	32	33	30	28
1	Rheumatism	69	69	70	68	70	68	68	71	71	72	68	60
2	Neuralgia‡	66	67	67	68	70	69	68	65	64	59	......	......
3	Bronchitis	61	55	56	56	61	66	65	62	64	64	64	55
4	Consumption, Pul.‡	64	51	55	58	63	61	66	71	68	70	71	52
5	Diarrhea	47	48	45	46	52	49	48	52	47	48	41	41
6	Intermittent Fever	72	48	54	59	65	69	71	82	82	82	82	75
7	Tonsilitis‡	49	47	49	50	50	50	48	48	49	45	......	......
8	Influenza	40	33	35	34	41	43	40	35	42	45	44	41
9	Remittent Fever‡	48	32	34	36	44	41	48	54	56	57	58	52
10	Pneumonia	37	28	27	27	29	38	39	41	42	41	41	40
11	Erysipelas	23	24	23	24	26	25	22	23	25	25	21	20
12	Dysentery	19	19	17	15	23	21	17	23	18	18	19	21
13	Cholera Morbus	19	19	17	17	22	18	17	26	20	19	14	15
14	Inflam. of Kidney‡	22	18	20	21	26	......	......	......	......	......	......	......
15	Typho-Mal. Fever ‡	22	16	16	16	20	18	24	29	24	22	24	26
16	Inflam. of Bowels‡	15	16	17	17	17	16	13	14	12	......	......	......
17	Measles	13	14	6	5	10	24	11	26	19	12	5	7
18	Whooping-cough	20	14	20	14	23	15	17	16	32	23	21	21
19	Cholera Infantum	13	13	14	11	15	14	12	18	14	14	11	11
20	Typhoid Fev. (Ent.)	12	10	8	8	12	11	14	18	14	12	10	14
21	Diphtheria	22	10	13	14	15	17	25	34	27	29	23	19
22	Scarlet Fever	18	8	11	12	16	19	18	19	15	23	25	21
23	Puerperal Fever	5	6	5	6	7	7	7	5	3	3	3	4
24	Inflam. of Brain‡	6	6	5	6	7	6	5	5	6	......	......	......
25	Membranous Croup	6	4	5	5	6	6	7	9	6	7	7	6
26	Cerebro-Spi. Men'gitis	5	3	4	6	7	5	6	9	2	2	2	3
27	Small-pox	1	.02	0.4	0.2	0.1	0.3	3	2	0.4	0.4	0.2	4
	No. of reports rec'd	4,171	4,896	5,583	5,108	3,957	4,458	4,745	3,567	3,991	3,755	3,221	3,320

---

* For 1887 the number of observers, reports, weeks in each month, etc., are stated in the first five columns of Exhibit III., page 88, the names of the observers and the number of the reports received from each are stated in Exhibit V., pages 92, 93, 94.

† The numbers opposite the names of the diseases do not state what per cent of the whole number of reports for the year stated the disease to be present at some time during the year, but state (on an average for twelve months of the year), what per cent of reports for the several months stated the disease to be present in those months. The column for each year is thus a statement for an average month of that year. On the two following pages of this table, however, the columns for each month state what per cent of the reports for that month (the number of which is stated at the foot of the column) stated the given disease to be present in that month.

[‡ For foot-note see page 94.]

EXHIBIT IV.—CONTINUED.—*Stating for each of 27 Diseases by Months, on what Per*

What Per Cent of the Reports Received Stated Presence of the Disease.‡

Line Number.	January.*					February.*					March.*				
	Diseases.	Av. '77-'86.	1887.	1886.	1885.	Diseases.	Av. '77-'86.	1887.	1886.	1885.	Diseases.	Av. '77-'86.	1887.	1886.	1885.
	Average Disease.†	30	26	26	29	Average Disease.†	31	27	26	29	Average Disease.†	31	28	28	30
1	Rheumatism	73	76	68	73	Rheumatism	73	74	71	76	Rheumatism	75	77	78	82
2	Neuralgia	69	72	69	79	Neuralgia	[illegible]	73	69	79	Neuralgia	74	76	74	77
3	Bronchitis	77	67	71	73	Bronchitis	77	69	69	74	Bronchitis	77	67	71	76
4	Tonsilitis	60	56	62	63	Tonsilitis	62	59	63	58	Consumpt'n, Pul.	66	61	60	71
5	Consumption, Pul.	64	53	61	60	Consumpt'n, Pul.	66	54	58	68	Tonsilitis	61	61	63	61
6	Pneumonia	58	48	37	50	Influenza	60	52	51	60	Influenza	59	50	62	52
7	Influenza	55	47	44	58	Pneumonia	63	51	46	58	Pneumonia	61	50	52	60
8	Intermittent Fev.	58	39	47	51	Intermittent Fev.	60	42	49	52	Intermittent Fev.	63	48	50	51
9	Remittent Fev.	40	29	33	33	Diarrhea	28	32	31	31	Erysipelas	28	32	26	35
10	Diarrhea	27	28	27	26	Erysipelas	27	28	25	35	Diarrhea	29	31	25	35
11	Erysipelas	27	23	25	32	Remittent Fev.	39	26	29	32	Remittent Fev.	41	27	34	43
12	Inflam. of Kidney	25	22	21	26	Inflam. of Kidney.	26	22	19	27	Inflam. of Kidney.	25	23	21	24
13	Inflam. of Bowels	13	16	16	14	Measles	13	17	5	7	Measles	16	22	6	10
14	Diphtheria	28	13	18	14	Inflam. of Bowels	13	16	15	16	Inflam. of Bowels	15	17	15	20
15	Whooping-cough	20	12	16	18	Whooping-cough	20	15	17	16	Whooping-cough	20	15	17	20
16	Measles	10	11	4	4	Typho-mal. Fev.	15	12	9	16	Scarlet Fever	24	12	17	14
17	Scarlet Fever	22	11	11	16	Scarlet Fever	24	11	12	18	Diphtheria	21	11	11	11
18	Typho-mal. Fev.	18	10	10	15	Diphtheria	24	11	14	10	Dysentery	8	10	7	7
19	Membr. Croup	12	10	7	16	Typhoid Fev. (ent.)	8	10	3	7	Typho-mal. Fev.	14	10	12	14
20	Inflam. of Brain	6	9	7	8	Inflam. of Brain	6	9	5	7	Puerperal Fev.	7	7	6	10
21	Dysentery	7	7	5	8	Dysentery	7	8	8	7	Inflam. of Brain	6	6	6	9
22	Typhoid Fev. (En.)	11	6	6	11	Membran. Croup	10	6	6	10	Typhoid Fev. (ent.)	7	4	4	5
23	Puerperal Fever	5	5	6	5	Puerperal Fev.	5	5	5	5	Membran. Croup	8	4	4	10
24	Cholera Morbus	4	4	3	3	Cer.-spinal Men.	5	3	4	9	Cholera Morbus	6	3	3	8
25	Cholera Infantum.	2	3	1	3	Cholera Morbus	5	3	2	4	Cer.-spinal Men.	6	2	7	12
26	Cer.-spinal Men.	4	2	4	8	Cholera Infantum	2	3	1	1	Cholera Infantum.	2	2	2	1
27	Small-pox	1.6	0	0	0	Small-pox	1.2	0	0	1	Small-pox	0.9	0	0	0.4
	Reports received.§	354	393	448	280	Reports received.§	321	379	465	274	Reports received.§	347	424	530	271

Line Number.	April.*					May.*					June.*				
	Diseases.	Av. '77-'86.	1887.	1886.	1885.	Diseases.	Av. '77-'86.	1887.	1886.	1885.	Diseases.	Av. '77-'86.	1887.	1886.	1885.
	Average Disease.†	30	26	27	28	Average Disease.†	28	25	26	25	Average Disease.†	27	24	23	24
1	Rheumatism	75	77	76	79	Rheumatism	71	71	74	74	Rheumatism	68	70	70	71
2	Neuralgia	73	71	74	75	Neuralgia	67	67	71	67	Neuralgia	65	66	63	67
3	Bronchitis	71	62	65	73	Bronchitis	61	57	57	56	Diarrhea	45	52	40	44
4	Consumpt'n, Pul.	68	61	61	69	Consumpt'n, Pul.	65	54	60	58	Intermittent Fev.	80	52	61	68
5	Tonsilitis	53	53	54	53	Intermittent Fev.	78	52	57	64	Bronchitis	53	49	45	52
6	Intermittent Fev.	72	50	61	57	Tonsilitis	47	46	44	50	Consumpt'n, Pul.	64	48	55	61
7	Influenza	53	43	54	41	Diarrhea	37	36	38	36	Tonsilitis	42	37	39	43
8	Pneumonia	54	41	41	50	Influenza	38	34	35	31	Remittent Fev.	48	30	36	35
9	Diarrhea	32	32	31	23	Pneumonia	39	34	29	31	Cholera Morbus	18	25	12	18
10	Remittent Fev.	44	30	34	38	Remittent Fev.	47	30	35	33	Erysipelas	24	23	24	24
11	Erysipelas	28	29	31	29	Erysipelas	26	27	28	27	Influenza	28	23	26	23
12	Measles	21	22	5	10	Measles	26	25	11	9	Inflam. of Kidney	22	29	19	21
13	Inflam. of Kidney	24	21	25	22	Inflam. of Kidney.	25	20	24	22	Measles	21	19	7	7
14	Whooping-cough	17	13	15	17	Inflam. of Bowels	13	16	19	18	Pneumonia	25	16	19	19
15	Inflam. of Bowels	13	11	13	17	Whooping-cough	19	16	23	9	Inflam. of Bowels	16	15	18	18
16	Typho-mal. Fev.	12	10	9	10	Cholera Morbus	8	13	8	10	Whooping-cough	20	15	23	10
17	Scarlet Fever	22	10	12	13	Dysentery	9	11	10	7	Dysentery	14	14	10	11
18	Puerperal Fever	5	8	7	8	Inflam. of Brain	6	8	5	5	Cholera Infantum.	10	13	10	7
19	Dysentery	8	8	7	9	Diphtheria	17	6	12	9	Inflam. of Brain	6	8	7	7
20	Membr. Croup	7	6	3	6	Typho-mal. Fev.	12	6	11	11	Typho-mal. Fev.	12	7	10	10
21	Inflam. of Brain	7	5	7	11	Scarlet Fever	20	6	13	13	Puerperal Fev.	5	7	5	5
22	Diphtheria	20	5	12	6	Cer.-spinal Men.	6	5	3	6	Diphtheria	15	5	9	12
23	Cholera Morbus	6	4	5	7	Cholera Infantum.	3	5	5	5	Cer.-spinal Men.	5	4	2	5
24	Typhoid Fev. (ent.)	6	3	3	4	Membran. Croup	5	5	4	3	Typhoid Fev. (ent.)	6	4	4	5
25	Cer.-spinal Men.	7	3	4	8	Puerperal Fev.	5	5	5	6	Scarlet Fever	17	4	18	15
26	Cholera Infantum.	2	1	2	2	Typhoid Fev. (ent.)	5	3	5	3	Membran. Croup	4	2	4	3
27	Small-pox	1.6	0	0	0.3	Small-pox	2.4	0	0	1	Small-pox	1.9	0	0.4	1
	Reports received.§	304	306	368	314	Reports received.§	334	367	398	347	Reports received.§	336	515	508	399

---

* For 1887 the number of observers, reports, weeks in each month, etc., are stated in the first five columns of Exhibit III, page 88, the names of observers and the number of reports received from each are stated in Exhibit V., pages 92–94.

† The numbers in this line are an average, not for all diseases represented, but only for those reported present in the given month. ‡ See foot-note with this mark on page 94.

§ The numbers in this line state how many reports were received for the month in the given year.

Cent of the Reports Received the Diseases were stated to be Present in the Years 1885–87.

What Per Cent of the Reports Received Stated Presence of the Disease.‡

July.*					August.*					September.*					
Diseases.	Av. '77-'86.	1887.	1886.	1885.	Diseases.	Av. '77-'86.	1887.	1886.	1885.	Diseases.	Av. '77-'86.	1887.	1886.	1885.	Line Number.
Average Disease.†	29	27	25	26	Average Disease.†	32	29	27	27	Average Disease.†	33	26	28	27	
Diarrhea	73	82	66	65	Diarrhea	86	85	82	77	Diarrhea	81	71	81	65	1
Neuralgia	60	62	63	61	Rheumatism	57	61	62	59	Rheumatism	61	66	65	60	2
Cholera Morbus	47	59	41	40	Neuralgia	58	59	60	58	Neuralgia	61	65	61	64	3
Rheumatism	62	57	63	63	Cholera Morbus	57	55	54	47	Intermittent Fev.	81	53	58	65	4
Intermittent Fev.	82	53	61	67	Dysentery	54	55	44	34	Bronchitis	48	47	41	45	5
Consumpt'n, Pul.	61	48	51	56	Intermittent Fev.	81	56	60	55	Consumpt'n, Pul.	60	45	48	54	6
Cholera Infantum	31	44	29	22	Consumpt'n, Pul.	58	47	52	52	Remittent Fev.	60	41	36	40	7
Bronchitis	43	41	40	44	Cholera Infantum	48	45	47	35	Tonsilitis	37	38	39	49	8
Dysentery	31	36	24	16	Remittent Fev.	57	40	36	39	Dysentery	48	37	43	29	9
Remittent Fev.	51	31	36	32	Bronchitis	41	38	37	39	Typho-mal. Fev.	40	33	27	24	10
Tonsilitis	33	29	32	38	Tonsilitis	32	31	31	37	Cholera Morbus	39	31	40	26	11
Whooping-cough	22	22	23	14	Typho-mal. Fev.	25	27	18	15	Influenza	29	27	21	30	12
Inflam. of Bowels	18	20	20	16	Inflam. of Bowels	21	21	21	20	Typhoid Fev. (ent.)	20	22	16	11	13
Erysipelas	21	17	20	21	Erysipelas	19	18	18	16	Cholera Infantum	36	21	42	18	14
Measles	14	15	4	8	Influenza	21	18	10	18	Erysipelas	17	18	18	17	15
Typho-mal. Fev.	16	13	14	10	Whooping-cough	23	18	26	16	Inflam. of Bowels	17	17	20	13	16
Influenza	20	13	14	18	Typhoid Fev. (ent.)	13	14	13	6	Inflam. of Kidney	18	14	15	17	17
Inflam. of Kidney	20	13	19	18	Inflam. of Kidney	20	12	18	19	Pneumonia	17	14	12	12	18
Pneumonia	16	10	11	11	Pneumonia	13	8	10	10	Whooping-cough	22	11	24	16	19
Typhoid Fev. (ent.)	7	8	5	5	Puerperal Fev.	5	7	5	5	Diphtheria	18	7	10	15	20
Inflam. of Brain	6	7	6	6	Inflam. of Brain	7	6	6	6	Puerperal Fev.	5	7	4	4	21
Puerperal Fev.	4	6	4	5	Diphtheria	16	6	10	13	Scarlet Fever	13	7	7	7	22
Diphtheria	15	5	10	14	Measles	7	6	4	2	Inflam. of Brain	6	5	4	5	23
Cer.-spinal Men.	4	3	4	8	Cer.-spinal Men.	4	4	2	6	Measles	5	4	4	2	24
Scarlet Fever	14	3	7	13	Scarlet Fever	12	4	6	8	Cer.-spinal Men.	4	3	2	6	25
Membran. Croup	2	1	2	2	Membran. Croup	3	2	3	1	Membran. Croup	4	2	5	3	26
Small-pox	1.5	0	1	0	Small-pox	0.7	0	1	0	Small-pox	0.4	0.3	0.5	0	27
Reports received.§	362	412	446	564	Reports received.§	373	507	470	485	Reports received.§	364	382	567	601	

October.*					November.*					December.*					
Diseases.	Av. '77-'86.	1887.	1886.	1885.	Diseases.	Av. '77-'86.	1887.	1886.	1885.	Diseases.	Av. '77-'86.	1887.	1886.	1885.	Line Number.
Average Disease.†	31	25	25	26	Average Disease.†	30	24	25	26	Average Disease.†	29	24	25	26	
Neuralgia	63	66	63	62	Rheumatism	72	69	72	70	Rheumatism	74	70	73	70	1
Rheumatism	67	66	69	64	Neuralgia	68	66	67	67	Neuralgia	70	65	73	73	2
Bronchitis	54	57	51	51	Bronchitis	66	57	61	58	Bronchitis	71	61	65	64	3
Intermittent Fev.	79	50	57	60	Tonsilitis	55	54	52	58	Tonsilitis	60	57	61	60	4
Consumpt'n, Pul.	63	48	51	55	Consumpt'n, Pul.	64	47	55	56	Consumpt'n, Pul.	63	50	54	56	5
Tonsilitis	45	47	44	48	Intermittent Fev.	70	42	48	55	Intermittent Fev.	61	39	41	49	6
Diarrhea	56	46	51	44	Influenza	41	35	36	37	Influenza	48	38	42	40	7
Remittent Fev.	58	42	33	39	Diarrhea	36	34	36	33	Remittent Fev.	42	31	27	31	8
Typho-mal. Fev.	43	30	25	25	Remittent Fev.	48	31	34	38	Pneumonia	45	31	37	39	9
Influenza	33	28	27	31	Pneumonia	33	28	22	22	Diarrhea	28	30	27	27	10
Erysipelas	21	21	21	18	Erysipelas	22	26	20	26	Erysipelas	24	25	20	28	11
Dysentery	25	18	25	16	Diphtheria	29	19	18	16	Inflam. of Kidney	23	17	22	20	12
Typhoid Fev. (ent.)	22	18	16	13	Typho-mal. Fev.	33	17	24	21	Inflam. of Bowels	14	15	16	17	13
Inflam. of Kidney	32	18	18	21	Inflam. of Kidney	20	16	17	19	Diphtheria	28	12	15	17	14
Pneumonia	22	17	13	17	Typhoid Fev. (ent.)	21	15	13	16	Typhoid Fev. (ent.)	15	11	10	8	15
Diphtheria	26	16	17	19	Inflam. of Bowels	14	11	12	16	Measles	7	11	7	3	16
Inflam. of Bowels	15	13	17	17	Scarlet Fever	17	10	9	11	Scarlet Fever	18	11	13	11	17
Cholera Morbus	16	10	13	10	Whooping-cough	20	10	19	14	Dysentery	7	9	7	7	18
Scarlet Fever	16	9	12	13	Measles	6	9	5	3	Typho-mal. Fev.	22	9	15	14	19
Whooping-cough	19	9	20	15	Membran. Croup	9	8	9	5	Whooping-cough	19	9	14	13	20
Cholera Infantum	14	6	17	8	Dysentery	12	7	12	12	Inflam. of Brain	5	6	6	6	21
Inflam. of Brain	5	5	4	5	Cholera Morbus	7	4	6	7	Membran. Croup	10	6	8	5	22
Measles	5	5	4	1	Puerperal Fev.	5	4	4	7	Puerperal Fev.	5	5	5	7	23
Membran. Croup	6	4	8	3	Inflam. of Brain	5	3	4	5	Cholera Morbus	5	4	5	5	24
Cer.-spinal Men.	4	3	4	5	Cer.-spinal Men.	3	3	3	2	Cer.-spinal Men.	4	2	4	4	25
Puerperal Fev.	5	3	6	5	Cholera Infantum	4	3	5	4	Cholera Infantum	2	2	2	2	26
Small-pox	0.5	0	0.9	0	Small-pox	0.8	0	0.7	0	Small-pox	0.7	0	0.4	0	27
Reports received.§	369	376	446	495	Reports received.§	341	474	433	498	Reports received.§	367	361	504	580	

*, †, ‡. See notes with these marks on page 89.
§ For this foot-note see page 90.

EXHIBIT V.—*By Months and by Geographical Divisions of the State, the Names of 155 Observers whose Weekly Reports of Diseases for 1887 are Compiled in Tables 1, 2, 3, and 4, the Localities*[a] *for which they Report, and the Number of reports received from each Observer.*

Divisions and Localities Represented and Physicians who Reported. (Health Officers in Italics; Regular Correspondents marked with a *.)	Weekly Reports in 1887.—Compiled in this Article.												
	Year 1887.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
All Localities	*4,896*	*393*	*379*	*424*	*306*	*367*	*516*	*412*	*507*	*382*	*376*	*474*	*361*
Upper Peninsular Division†	*186*	*12*	*12*	*14*	*11*	*11*	*23*	*16*	*20*	*16*	*15*	*20*	*16*
Allouez, *Fred K. Smith, M. D.*	31	----	----	----	----	----	5	4	5	4	4	5	4
Houghton, *H. W. Jones, M. D.* *	26	4	4	5	4	4	5	----	----	----	----	----	----
Ishpeming, *G. G. Barnett, M. D.*	51	4	4	5	4	3	5	4	5	4	4	5	4
Ishpeming, *T. A. Felch, M. D.*	50	4	4	4	3	4	5	4	5	4	4	5	4
Rockland, *W. A. Burnham, M. D.*	28	----	----	----	----	----	3	4	5	4	3	5	4
Northwestern Division†	*97*	*8*	*7*	*5*	*7*	*8*	*10*	*8*	*10*	*8*	*8*	*10*	*8*
Frankfort, *I. Voorheis, M. D.*	46	4	3	----	4	4	5	4	5	4	4	5	4
Manistee, L. S. Ellis, M. D.	16	4	4	5	3	----	----	----	----	----	----	----	----
Manistee, *J. F. Hincks, M. D.*	35	----	----	----	----	4	5	4	5	4	4	5	4
Northern Division†	*183*	*11*	*9*	*12*	*7*	*10*	*13*	*18*	*23*	*16*	*20*	*24*	*20*
Bellaire, *J. B. Hull, M. D.*	29	----	----	----	3	3	3	----	5	2	4	5	4
Harbor Springs, O. F. Burroughs, M. D.	28	----	----	----	----	3	----	4	5	4	4	4	4
Harbor Springs, L. W. Gardner, M. D.	13	4	4	5	----	----	----	----	----	----	----	----	----
Kalkaska, *S. A. Johnson, M. D.*	31	----	----	----	----	----	5	4	5	4	4	5	4
Mackinaw City, *H. P. Smith, M. D.*	32	4	3	4	2	----	----	4	3	3	----	5	4
Petoskey, *W. A. S. Williams, M. D.*	14	3	2	3	----	----	----	2	----	----	4	----	----
Petoskey, *A. H. Winslow, M. D.*	36	----	----	----	2	4	5	4	5	3	4	5	4
Northeastern Division†	*194*	*12*	*12*	*15*	*11*	*15*	*25*	*20*	*19*	*16*	*16*	*19*	*14*
Alpena, *D. A. Cameron, M. D.*	9	----	----	----	----	----	5	4	----	----	----	----	----
Alpena, J. D. Dunlop, M. D.	13	4	4	5	----	----	----	----	----	----	----	----	----
East Tawas, *J. S. Reeves, M. D.* *	49	4	4	5	4	4	5	4	5	4	4	4	2
Harrisville, D. W. Mitchell, M. D.	52	4	4	5	4	4	5	4	5	4	4	5	4
Long Rapids, *H. A. Stonex, M. D.*	38	----	----	----	3	4	5	4	5	4	4	5	4
West Branch, *C. F. Cochran, M. D.* *	33	----	----	----	----	3	5	4	4	4	4	5	4
Western Division†	*382*	*35*	*32*	*38*	*25*	*27*	*40*	*31*	*40*	*26*	*29*	*35*	*24*
Grand Haven, *A. Vander Veen, M. D.* *	31	----	----	----	----	----	5	4	5	4	4	5	4
Grand Rapids, A. Hazlewood, M. D.	50	4	4	5	4	4	5	4	5	2	4	5	4
Hart, *A. A. Dunton, Jr., M. D.* *	49	4	4	5	4	4	5	3	5	2	4	5	4
Lowell, A. M. Elsworth, M. D.	52	4	4	5	4	4	5	4	5	4	4	5	4
Ludington, *G. W. Crosby, M. D.*	35	----	----	----	----	4	5	4	5	4	4	5	4
Ludington, F. W. Graham, M. D.	17	4	4	5	4	----	----	----	----	----	----	----	----
Montague, *L. E. Jones, M. D.*	11	4	4	3	----	----	----	----	----	----	----	----	----
Muskegon, J. P. Stoddard, M. D.	13	4	4	5	----	----	----	----	----	----	----	----	----
North Muskegon, *G. C. Havens, M. D.*	37	3	----	----	3	4	5	4	5	4	4	5	----
Pentwater, *G. H. Cleveland, M. D.* *	41	4	4	5	4	4	5	4	5	4	2	----	----
Whitehall, *C. E. Walters, M. D.*	46	4	4	5	2	3	5	4	5	2	3	5	4
Northern Central Division†	*228*	*16*	*16*	*15*	*14*	*20*	*29*	*24*	*28*	*21*	*15*	*19*	*11*
Big Rapids, *I. W. Badger, M. D.*	52	4	4	5	4	4	5	4	5	4	4	5	4
Clare, *J. H. Carpenter, M. D.*	24	----	----	----	3	4	5	4	5	3	----	----	----
Coleman, *J. L. Budge, M. D.*	16	----	----	----	----	----	5	4	5	2	----	----	----
Farwell, *E. B. Evans, M. D.*	52	4	4	5	4	4	5	4	5	4	4	5	4
Harrison, *P. E. Witherspoon, M. D.*	32	----	----	----	----	4	4	4	4	4	4	5	3
Midland City, T. J. Secor, M. D.	8	4	4	----	----	----	----	----	----	----	----	----	----
Morley, B. H. McMullen, M. D.	44	4	4	5	3	4	5	4	4	4	3	4	----
Bay and Eastern Division†	*807*	*70*	*60*	*72*	*59*	*52*	*81*	*67*	*85*	*58*	*63*	*81*	*59*
Algonac, *W. K. Moore, M. D.*	52	4	4	5	4	4	5	4	5	4	4	5	4
Almont, *A. Price, M. D.*	41	4	4	4	----	----	5	4	4	4	3	5	4
Attica, *J. H. Curnalia, M. D.*	43	4	4	5	4	4	5	4	5	4	4	----	----
Bay City, *J. W. Caughlin, M. D.*	8	4	----	----	4	----	----	----	----	----	----	----	----
Brown City, *J. A. Watson, M. D.*	46	4	4	5	3	3	5	3	4	4	4	4	3
Capac, *J. R. McGurk, M. D.*	42	4	----	----	3	4	5	4	5	4	4	5	4
Columbiaville, *C. A. Wisner, M. D.* *	52	4	4	5	4	4	5	4	5	4	4	5	4
Croswell, *H. Carey, M. D.*	32	3	4	3	4	3	4	3	4	2	2	----	----
Dryden, I. E. Parker, M. D.	18	----	----	----	----	----	----	----	3	2	4	5	4
East Saginaw, W. L. Dickinson, M. D.	11	----	----	----	----	----	----	----	----	----	2	5	4
Emmett, *A. J. Abbott, M. D.*	25	3	----	----	4	----	----	4	3	4	----	5	2

---

[a] In many cases the reports include sickness in the vicinity as well as the corporate limits of the places named.

* Regular correspondent and Health Officer. † For counties in each division see Exhibit I., page 85.

EXHIBIT V.—CONTINUED.

Divisions and Localities Represented and Physicians who Reported. Health Officers in Italics; Regular Correspondents marked with a *.	Weekly Reports in 1887—Compiled in this Article.												
	Year 1887.	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.
Bay and Eastern Division—*Continued*†													
Emmett, *M. J. Coveny, M. D.*	15	----	----	----	----	----	5	3	5	2	----	----	----
Essexville, *A. J. Harris, M. D.*	52	4	4	5	4	4	5	4	5	4	4	5	4
Fort Gratiot, S. W. Merritt, M. D.	13	4	4	5	----	----	----	----	----	----	----	----	----
Fort Gratiot, O. M. Stephenson, M. D.	38	----	----	----	4	4	5	3	5	4	4	5	4
Marine City, *F. Blagborne, M. D.*	13	----	----	----	----	2	4	3	4	----	----	----	----
Marine City, D. L. Parker, M. D.	17	4	4	5	4	----	----	----	----	----	----	----	----
Metamora, *G. W. Stone, M. D.*	13	4	4	5	----	----	----	----	----	----	----	----	----
Port Huron, C. C. Clancy, M. D.	51	4	4	5	4	4	4	4	5	4	4	5	4
Saginaw, L. W. Bliss, M. D.	5	----	----	----	----	----	----	----	----	----	----	3	2
Sand Beach, *H. R. Hitchcock, M. D.*	52	4	4	5	4	4	5	4	5	4	4	5	4
Sandusky, L. C. Read, M. D.	42	4	4	5	4	4	5	4	4	----	4	4	----
Thornville, *J. S. Caulkins, M. D.* *	51	4	4	5	3	4	5	4	5	4	4	5	4
Vassar, T. A. Cullis, M. D.	15	4	4	5	2	----	----	----	----	----	----	----	----
Vassar, J. R. Nunn, M. D.	34	----	----	----	----	4	5	4	4	4	4	5	4
Zilwaukee, *J. J. Lyon, M. D.*	26	----	----	----	----	----	4	4	5	----	4	5	4
Central Division †	*700*	*67*	*67*	*67*	*40*	*48*	*70*	*54*	*76*	*49*	*54*	*62*	*46*
Assyria, C. E. Fay, M. D.	7	4	3	----	----	----	----	----	----	----	----	----	----
Durand, *A. G. Cowles, M. D.* *	50	4	4	5	4	4	5	4	4	4	4	5	3
Edmore, L. A. Roller, M. D.	12	4	4	4	----	----	----	----	----	----	----	----	----
Flint, O. Millard, M. D.	6	4	2	----	----	----	----	----	----	----	----	----	----
Flint, G. W. Howland, M. D.	22	----	----	----	----	4	5	4	4	2	3	----	----
Greenville, H. L. Bower, M. D.	12	4	3	5	----	----	----	----	----	----	----	----	----
Greenville, *C. M. Martin, M. D.*	46	4	4	5	2	3	4	2	5	4	4	5	4
Hastings, A. P. Drake, M. D. *	51	4	4	5	4	4	5	3	5	4	4	5	4
Hastings, E. H. Lathrop, M. D.	17	4	4	5	4	----	----	----	----	----	----	----	----
Hastings, W. P. Polhemus, M. D.	21	----	----	----	----	2	5	3	5	----	2	----	4
Howard City, S. E. Morgan, M. D.	23	----	----	----	----	----	5	3	4	3	3	5	----
Howell, *J. A. Wessinger, M. D.*	23	----	----	----	----	2	----	----	5	4	4	4	4
Hubbardston, *C. S. Park, M. D.*	50	4	4	5	3	4	5	4	5	3	4	5	4
Lakeview, *C. O. Adams, M. D.*	12	----	----	----	----	2	4	2	----	----	----	4	----
Lakeview, A. H. Forsyth, M. D.	12	3	4	5	----	----	----	----	----	----	----	----	----
Laingsburg, *M. McKenzie, M. D.*	13	----	----	----	----	----	3	2	4	2	2	----	----
Lansing, H. Ostrander, M. D.	12	----	----	----	----	----	----	----	----	----	4	4	4
Lansing, J. H. Wellings, M. D.	38	4	4	5	4	4	5	4	5	3	----	----	----
Lyons, *B. M. Hutchinson, M. D.*	52	4	4	5	4	4	5	4	5	4	4	5	4
McBride, W. P. Gamber, M. D.	8	4	4	----	----	----	----	----	----	----	----	----	----
Maple Rapids, *R. H. Sanborn, M. D.*	8	----	----	----	----	----	----	3	5	----	----	----	----
Middleville, *G. W. Matteson, M. D.*	51	4	4	5	4	4	4	4	5	4	4	5	4
Otisville, *J. B. Laing, M. D.*	6	----	3	----	3	----	----	----	----	----	----	----	----
Portland, *G. D. Allen, M. D.*	11	4	4	3	----	----	----	----	----	----	----	----	----
St. Johns, *L. W. Fasquelle, M. D.*	35	----	----	----	----	4	5	4	5	4	4	5	4
Sheridan, W. H. Budd, M. D.	51	4	4	5	4	4	5	4	5	4	4	5	3
Wood's Corners, G. Pray, M. D.	51	4	4	5	4	3	5	4	5	4	4	5	4
Southwestern Division †	*508*	*40*	*40*	*45*	*30*	*49*	*55*	*42*	*54*	*41*	*35*	*45*	*32*
Benton Harbor, *G. M. Bell, M. D.*	8	----	----	----	----	3	5	----	----	----	----	----	----
Benton Harbor, I. R. Dunning, M. D.	11	4	4	3	----	----	----	----	----	----	----	----	----
Berrien Springs, *A. J. Dispennett, M. D.*	35	----	----	----	----	4	5	4	5	4	4	5	4
Bloomingdale, *W. B. Hathaway, M. D.*	51	4	4	5	4	4	5	4	4	4	4	5	4
Decatur, *C. T. Baker, M. D.*	21	----	----	----	----	3	5	4	5	4	----	----	----
Douglass, *W. B Clark, M. D.*	29	----	----	----	----	4	----	4	5	3	4	5	4
Hartford, *H. C. Maynard, M. D.*	52	4	4	5	4	4	5	4	5	4	4	5	4
Lawrence, *A. S. Haskin, M. D.*	16	4	4	5	----	3	----	----	----	----	----	----	----
Lawton, *R. C. Moffit, M. D.*	28	----	----	----	----	4	5	2	5	4	3	5	----
Marcellus, C. E. Spicer, M. D.	20	4	4	5	4	3	----	----	----	----	----	----	----
New Buffalo, *A. E. Mason, M. D.*	20	----	----	----	----	2	5	4	5	4	----	----	----
Niles, *O. P. Horn, M. D.* *	50	4	4	5	4	4	5	4	5	2	4	5	4
Otsego, M. Chase, M. D. *	50	4	4	3	4	4	5	4	5	4	4	5	4
Otsego, *L. E. Clark, M. D.*	52	4	4	5	4	4	5	4	5	4	4	5	4
Saugatuck, *J. B. Cook, M. D.*	51	4	4	5	4	3	5	4	5	4	4	5	4
South Haven, G. D. Carnes, M. D.	14	4	4	4	2	----	----	----	----	----	----	----	----
Southern Central Division †	*980*	*80*	*82*	*91*	*65*	*78*	*100*	*80*	*91*	*81*	*70*	*89*	*73*
Adrian, *F. R. Seger, M. D.*	34	----	----	----	----	3	5	4	5	4	4	5	4
Adrian, J. Tripp, M. D.	8	4	4	----	----	----	----	----	----	----	----	----	----
Ann Arbor, *J. Kapp, M. D.*	50	4	4	5	4	4	5	4	3	4	4	5	4
Bronson, *H. P. Mowry, M. D.*	35	----	2	3	4	4	3	3	3	4	----	5	4
Brooklyn, *L. M. Jones, M. D.*	30	----	----	----	----	4	5	----	4	4	4	5	4
Burr Oak, *C. D. Parsons, M. D.*	51	4	4	5	4	4	5	4	4	4	4	5	4
Burr Oak, *J. C. Rollman, M. D.*	52	4	4	5	4	4	5	4	5	4	4	5	4
Coldwater, *L. A. Warsabo, M. D.*	51	4	4	5	4	4	4	4	5	4	4	5	4
Dexter, *T. J. Ritter, M. D.*	13	----	----	----	----	----	4	4	3	2	----	----	----

---

*** Regular Correspondent and Health Officer.**

† For counties in each division see Exhibit I., page 85.

EXHIBIT V.—CONTINUED.

Divisions and Localities Represented and Physicians who Reported. Health Officers in Italics. Regular Correspondents marked with a *.	Weekly Reports in 1887—Compiled in this Article.												
	Year 1887.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Southern Central Division.—*Continued.* †													
Jackson, (Prison) N. H. Williams, M. D.	15	4	4	5	2	----	----	----	----	----	----	----	----
Jonesville, *H. M. Warren, M. D.*	43	4	4	----	----	3	5	4	5	4	4	5	4
Kalamazoo, H. B. Hemenway, M. D.	38	4	4	5	----	----	----	4	5	3	4	5	4
Kalamazoo, *Wm. Mottram, M. D.*	13	4	4	5	----	----	----	----	----	----	----	----	----
Kalamazoo, *H. H. Schaberg, M. D.*	45	4	4	5	4	4	4	3	----	4	4	5	4
Kalamazoo, W. B. Southard, M. D.	52	4	4	5	4	4	5	4	5	4	4	5	4
Litchfield, E. P. Buckley, M. D.	17	4	4	5	4	----	----	----	----	----	----	----	----
Litchfield, *J. O. Spinning, M. D.*	27	----	----	----	----	----	4	4	5	4	2	4	4
Marshall, *E. J. Marshall, M. D.*	51	4	4	4	4	4	5	4	5	4	4	5	4
Mendon, *H. C. Clapp, M. D.*	52	4	4	5	4	4	5	4	5	4	4	5	4
Morenci, N. H. Bailey, M. D.	24	4	4	5	4	4	3	----	----	----	----	----	----
Morenci, *C. M. Butler, M. D.*	5	----	----	----	----	----	----	----	----	3	----	----	2
Parma, *O. S. Hartson, M. D.*	50	4	4	4	4	4	4	4	5	4	4	5	4
Quincy, W. C. Marsh, M. D.	11	----	----	----	----	4	4	3	----	----	----	----	----
Richland, J. M. Rankin, M. D.	52	4	4	5	4	4	5	4	5	4	4	5	4
Union City, R. P. Beebe, M. D.	52	4	4	5	4	4	5	4	5	4	4	5	4
Union City, *E. Brumfield, M. D.*	26	----	----	----	----	4	5	4	5	4	4	----	----
Vicksburg, *C. H. McKain, M. D.*	50	4	4	5	4	4	5	4	5	3	4	5	3
Ypsilanti, *E. Batwell, M. D.* *	34	4	4	5	3	4	5	3	4	2	----	----	----
Southeastern Division †	*631*	*42*	*42*	*50*	*37*	*49*	*69*	*52*	*61*	*50*	*51*	*70*	*58*
Armada, *S. T. Beardslee, M. D.*	37	----	----	----	2	4	5	4	5	4	4	5	4
Armada, *C. H. Lincoln, M. D.* *	52	4	4	5	4	4	5	4	5	4	4	5	4
Clarkston, *L. C. Hammond, M. D.*	13	----	----	----	----	2	----	2	4	3	----	----	2
Detroit, W. H. Rouse, M. D.	50	4	4	5	3	4	5	4	5	4	3	5	4
Dundee, *J. B. Haynes, M. D.*	15	4	3	5	3	----	----	----	----	----	----	----	----
Farmington, *J. J. Moore, M. D.*	29	----	----	----	----	----	5	4	4	4	3	5	4
Holly, *L. E. Wickens, M. D.*	52	4	4	5	4	4	5	4	5	4	4	5	4
Memphis, *D. H. Cole, M. D.*	52	4	4	5	4	4	5	4	5	4	4	5	4
Monroe, *C. F. Heath, M. D.*	12	----	----	----	----	----	----	----	----	----	3	5	4
Monroe, G. B. McCallum, M. D.	6	3	3	----	----	----	----	----	----	----	----	----	----
New Haven, *Alexander Gunn, M. D.*	34	----	----	----	----	3	5	4	5	4	4	5	4
Northville, *J. M. Burgess, M. D.*	49	3	4	5	4	4	5	3	4	4	4	5	4
Northville, J. M. Swift, M. D.	48	4	4	5	2	2	5	4	5	4	4	5	4
Petersburg, *L. C. Jones, M. D.*	12	----	----	----	----	3	5	4	----	----	----	----	----
Pontiac, *M. W. Gray, M. D.* *	52	4	4	5	4	4	5	4	5	4	4	5	4
Richmond, *C. Mills, M. D.*	8	----	----	----	----	4	4	----	----	----	----	----	----
Romeo, *Wm. Greenshields, M. D.*	47	4	4	5	3	3	5	3	4	3	4	5	4
Wayne, *J. M. Truscott, M. D.*	52	4	4	5	4	4	5	4	5	4	4	5	4
Wyandotte, *E. P. Christian, M. D.*	11	----	----	----	----	----	----	----	----	----	2	5	4

* Regular Carrespondent and Health Officer.

† For counties in each division see Exhibit I., page 85.

Foot-notes from page 95.

† The numbers opposite the names of the diseases do not state what per cent of the whole number of observers for the year reported the disease present at some time during the year, but state (on an average for the twelve months of the year) by what per cent of the observers making reports for the several months, the disease was reported present in those months. The column for each year is thus a statement for an average month of that year. On the two following pages of this table, however, the columns for each month state what per cent of the observers for that month (the number of whom is stated at the foot of the column) reported the given disease in that month.

‡ Consumption, remittent fever, and typho-malarial fever were not printed on the first blanks used in making weekly reports (beginning with the month of September, 1876); neuralgia and tonsilitis were not printed on any blanks used prior to October, 1878, and not on all used for several months after that date; inflammation of brain and inflammation of bowels were not printed on any blanks used prior to July, 1879, and not on all used for several months after that date; inflammation of kidney was not printed on any blanks used prior to October, 1883, and not on all used for several months after that date; hence it is probable that these diseases were not so fully reported at first as were the other diseases.

Foot-note from page 89.]

‡ Consumption, remittent fever, and typho-malarial fever were not printed on the first blanks used in making weekly reports (beginning with the month of September, 1876); neuralgia and tonsilitis were not printed on any blanks used prior to October, 1878, and not on all used for several months after that date; inflammation of brain and inflammation of bowels were not printed on any blanks used prior to July, 1879, and not on all used for several months after that date; inflammation of kidney was not printed on any of the cards used prior to October, 1883, and not on all used for several months after that date; hence it is probable that these diseases were not so fully reported at first as were the other diseases.

TABLE 1.—*Stating, for each of the Eleven Years 1877-1887, and the Average for 1877-1886, by what Per Cent of Observers each of 27 Diseases was reported present in those Years (also the Average Number of Observers per Month and the Total Observers for each Year).—Compiled from Weekly Reports of Health Officers of Cities and Villages and from Regular Correspondents of the State Board of Health.*—Diseases arranged in order of Greatest Number of Observers reporting them present in 1887.—(Continued, for each Month of several of the above mentioned Years, on pages 96 and 97.)*

Line Number.	Diseases.	Observers by whom the Several Diseases were Reported Present.—Average Per Cents (per Month) of those making Reports.											
		Av. 1877-86.	1887.	1886	1885.	1884.	1883.	1882.	1881.	1880.	1879.	1878.	1877.
	Av. for tabulated diseases reported present	41	37	37	38	42	43	43	45	43	44	39	38
1	Neuralgia............‡	82	83	83	83	84	85	85	78	79	75	......	......
2	Rheumatism	83	82	85	83	83	83	85	84	85	85	81	78
3	Bronchitis	75	69	71	70	74	79	80	74	77	75	75	71
4	Tonsilitis ....‡	70	68	70	72	73	73	72	65	67	68	......	......
5	Diarrhea............	65	65	64	66	71	67	69	67	63	65	57	58
6	Intermittent Fever .	83	64	71	73	79	82	83	90	90	90	90	85
7	Consumption, Pul...	72	60	64	68	72	71	74	78	76	78	76	61
8	Remittent Fever	62	46	48	52	60	57	64	66	67	69	71	68
9	Influenza	53	46	48	47	53	56	55	48	54	57	57	54
10	Pneumonia...........	56	46	48	44	48	59	61	60	62	60	58	56
11	Erysipelas............	42	44	43	44	48	47	42	42	45	43	35	35
12	Cholera Morbus......	32	33	29	33	37	32	31	41	34	34	25	26
13	Dysentery	32	33	30	28	38	35	31	34	30	31	30	34
14	Inflam. of Bowels...‡	29	32	32	32	30	31	28	26	25	......	......	......
15	Inflam. of Kidney..‡	37	32	35	34	41	......	......	......	......	......	......	......
16	Typho-mal. Fever...	34	26	27	27	32	32	39	43	37	32	35	37
17	Whooping-cough......	28	24	28	21	29	23	26	24	42	31	28	28
18	Cholera Infantum ..	23	24	25	21	26	24	22	27	23	23	20	17
19	Measles...............	20	22	10	9	17	37	20	37	30	18	7	12
20	Diphtheria............	36	18	24	27	27	31	43	51	43	45	37	32
21	Scarlet Fever	30	15	20	22	29	32	32	32	26	36	38	33
22	Inflam. of Brain....‡	13	15	13	14	14	12	12	12	13	......	......	......
23	Typhoid Fev. (ent.)..	20	15	15	16	20	19	24	26	21	18	16	22
24	Puerperal Fever......	12	14	12	13	16	15	18	12	8	8	6	10
25	Membranous Croup.	14	10	12	10	14	14	15	19	13	16	14	14
26	Cerebro-Spinal Men.	9	7	8	12	12	11	12	16	6	5	6	6
27	Small-pox	2	0.01	0.5	0.4	0.2	1	5	4	1	1	1	5
	No. of Observers....	132	155	169	163	142	140	159	116	112	110	97	115
	Av. No. of Observers per month...........	83	114	113	104	79	88	93	70	79	73	64	66

---

* For 1887, the number of observers, reports, weeks in each month, etc., are stated in the first five columns of Exhibit III., page 88; the names of the observers and the number of the reports received from each are stated in Exhibit V., pages 92, 3, 4.

† ‡ Foot-notes are on preceding page.

TABLE [illegible].—[illegible] Twenty-six Diseases were [illegible]

Line Number	Diseases	Average [illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	January.					
	Average	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1–10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11	Remittent Fever	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12	Inflam. of Kidney	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13	Inflam. of Bowels	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
14	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
15	Membranous Croup	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
16	Whooping-cough	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
17	Scarlet Fever	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18	Inflam. of Brain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
19	Typho-malarial Fever	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
20	Measles	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
21	Dysentery	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
22	Puerperal Fever	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
23	Typhoid Fever (enteric)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
24	Cholera Morbus	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
25	Cholera Infantum	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
26	Cerebro-spinal Menin.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
27	Small-pox	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Observers	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	February.					
	Average	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1–10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11	Inflam. of Kidney	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12	Remittent Fever	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13	Inflam. of Bowels	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
14	Measles	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
15	Inflam. of Brain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
16	Whooping-cough	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
17	Scarlet Fever	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18	Diphtheria	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
19	Typho-malarial Fever	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
20	Typhoid Fever (enteric)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
21	Dysentery	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
22	Membranous Croup	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
23	Puerperal Fever	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
24	Cholera Morbus	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
25	Cholera Infantum	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
26	Cerebro-spinal Menin.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
27	Small-pox	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Observers	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	March.					
	Average	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1–10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11	Remittent Fever	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12	Measles	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13	Inflam. of Kidney	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
14	Inflam. of Bowels	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
15	Scarlet Fever	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
16	Whooping-cough	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
17	Dysentery	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18	Puerperal Fever	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
19	Diphtheria	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
20	Typho-malarial Fever	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
21	Inflam. of Brain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
22	Membranous Croup	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
23	Cholera Morbus	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
24	Cerebro-spinal Menin.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
25	Typhoid Fever (enteric)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
26	Cholera Infantum	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
27	Small-pox	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Observers	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Line Number	Diseases	Average [illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	April.*					
	Average	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	Rheumatism	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	Neuralgia	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	Tonsilitis	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	Bronchitis	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	Consumption of Lungs	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	Intermittent Fever	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7	Pneumonia	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8	Influenza	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9	Erysipelas	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	Diarrhea	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11	Remittent Fever	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12	Measles	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13	Inflam. of Kidney	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
14	Inflam. of Bowels	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
15	Whooping-cough	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
16	Typho-mal. Fever	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
17	Puerperal Fever	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18	Membranous Croup	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
19	Scarlet Fever	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
20	Dysentery	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
21	Cholera Morbus	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
22	Inflam. of Brain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
23	Diphtheria	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
24	Cer.-spinal Men.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
25	Cholera Infant'm	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
26	Typhoid Fev. (ent.)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
27	Small-pox	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Observers	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	May.*					
	Average	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	Neuralgia	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	Rheumatism	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	Bronchitis	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	Intermittent Fev.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	Tonsilitis	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	Consumpt'n Lu.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7	Pneumonia	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8	Influenza	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9	Diarrhea	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	Erysipelas	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11	Remittent Fev.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12	Measles	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13	Inflam. of Kidney	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
14	Inflam. of Bowels	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
15	Cholera Morbus	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
16	Whooping-cough	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
17	Dysentery	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18	Inflam. of Brain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
19	Typho-mal. Fev.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
20	Cholera Infant'm	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
21	Diphtheria	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
22	Mem'bran. Croup	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
23	Cer.-spinal Men.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
24	Scarlet Fever	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
25	Puerperal Fever	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
26	Typhoid F. (ent.)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
27	Small-pox	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Observers	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	June.*					
	Average	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	Rheumatism	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	Neuralgia	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	Diarrhea	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	Bronchitis	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	Intermittent Fev.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	Tonsilitis	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7	Consumpt'n Lu.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8	Cholera Morbus	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9	Remittent Fev.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	Erysipelas	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11	Inflam. of Kidney	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12	Influenza	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13	Inflam. of Bowels	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
14	Pneumonia	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
15	Dysentery	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
16	Measles	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
17	Whooping-cough	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18	Cholera Infant'm	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
19	Inflam. of Brain	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
20	Puerperal Fever	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
21	Typho-mal. Fev.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
22	Diphtheria	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
23	Cer.-spinal Men.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
24	Typhoid F. (ent.)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
25	Scarlet Fever	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
26	Mem'bran. Croup	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
27	Small-pox	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Observers	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

* For [illegible] the number of observers, [illegible] weeks [illegible] are stated in the first five columns of Exhibit [illegible], page [illegible]; the names of observers and [illegible] are stated in Exhibit [illegible], pages [illegible]. [illegible] The [illegible] represented, [illegible] See [illegible] with [illegible] on page [illegible]. § The numbers in this line state how many observers reported for the month in the given year. ¶ For first part of Table [illegible] and [illegible] heading, see page [illegible].

Reported Present by Months in each of Years 1884–1887, and the Average for the 1877–1886.

Per Cent of Observers by whom the Diseases were Reported Present.‡

July.*						August.*						September.*						
Diseases.	Av. '77-'86.	1887.	1886.	1885.	1884.	Diseases.	Av. '77-'86.	1887.	1886.	1885.	1884.	Diseases.	Av. '77-'86.	1887.	1886.	1885.	1884.	Line Number.
Average.........†	42	39	38	40	45	Average.........†	43	44	39	40	39	Average.........†	45	38	42	43	46	
Diarrhea..........	91	94	87	89	93	Diarrhea..........	97	96	94	96	96	Diarrhea..........	95	86	92	88	94	1
Neuralgia..........	78	79	81	80	82	Neuralgia..........	74	83	75	72	74	Neuralgia..........	78	85	83	78	80	2
Rheumatism	78	76	82	82	79	Rheumatism......	74	81	76	76	81	Rheumatism......	76	75	84	78	75	3
Cholera Morbus..	71	76	68	70	72	Dysentery	74	80	65	59	70	Intermitt. Fever.	90	70	77	85	86	4
Cholera Infantum	48	65	49	39	48	Cholera Morbus.	77	78	68	69	70	Bronchitis.........	62	59	54	66	61	5
Dysentery	51	65	43	30	55	Cholera Infant....	67	73	68	58	62	Dysentery	71	58	69	57	76	6
Intermitt. Fever..	90	65	79	80	87	Intermitt. Fever.	90	71	76	80	85	Tonsilitis..........	60	56	65	70	65	7
Consump., Pul....	69	56	58	65	74	Consump., Pul....	66	61	59	61	73	Cholera Morbus.	66	55	66	55	70	8
Bronchitis..........	59	55	56	57	66	Tonsilitis..........	53	56	52	57	57	Remitt'nt Fever.	74	55	55	63	74	9
Tonsilitis	55	45	55	61	61	Remitt'nt Fever.	71	55	47	57	64	Consump., Pul....	67	51	57	66	71	10
Remitt'nt Fever..	67	44	53	50	66	Bronchitis.........	55	55	54	51	64	Typho-mal. Fev.	57	49	44	41	50	11
Inflam. of Bowels.	34	37	35	34	36	Inflam.of Bowels	36	48	37	39	36	Influenza..........	43	40	39	49	48	12
Erysipelas..........	41	35	41	44	59	Typho-mal. Fev.	40	43	30	26	39	Cholera Infant....	59	39	69	45	68	13
Whooping-cough.	32	33	34	21	37	Erysipelas.........	35	39	38	59	70	Inflam.of Bowels	32	33	40	27	40	14
Inflam. of Kidney	33	26	33	33	39	Influenza	33	33	20	32	40	Erysipelas.........	35	33	40	39	41	15
Measles	23	24	8	15	16	Whooping-cough	32	32	37	23	35	Typhoid F. (ent.)	31	32	29	21	29	16
Influenza	31	24	25	27	39	Inflam.of Kidney	30	28	30	31	32	Pneumonia.........	31	28	27	30	19	17
Typho-mal. Fev....	28	22	27	20	28	Typhoid F. (ent.)	23	27	24	13	23	Inflam.of Kidney	27	23	26	28	31	18
Pneumonia	32	21	21	25	32	Pneumonia	26	19	22	21	21	Whooping-cough	30	20	36	23	28	19
Inflam. of Brain..	13	14	14	16	14	Puerperal Fever.	11	16	11	13	17	Puerperal Fever.	11	16	10	12	16	20
Diphtheria.........	28	13	16	28	20	Inflam. of Brain.	16	14	13	13	17	Diphtheria.........	32	14	23	31	21	21
Puerperal Fever..	11	12	8	15	17	Diphtheria	29	13	18	25	24	Scarlet Fever.....	22	13	15	16	16	22
Typhoid F. (ent.)..	13	11	12	20	28	Scarlet Fever.....	21	12	13	15	20	Inflam. of Brain.	13	10	11	12	16	23
Cer.-spinal Men....	9	8	11	17	9	Measles	13	11	9	3	10	Measles............	9	5	9	3	8	24
Scarlet Fever......	24	5	12	23	25	Cer.-spinal Men..	9	8	6	12	13	Membran. Croup	9	5	11	8	9	25
Membran. Croup.	5	2	5	4	7	Membran. Croup	6	4	6	2	7	Cer.-spinal Men.	10	4	8	15	13	26
Small-pox..........	3	0	1	0	0	Small-pox..........	1.2	0	1	0	0	Small-pox..........	1	1	1	0	0	27
Observers.........§	86	119	118	122	87	Observers.........§	89	123	123	127	84	Observers.........§	86	118	118	128	80	

October.*						November.*						December.*						
Diseases.	Av. '77-'86.	1887.	1886.	1885.	1884.	Diseases.	Av. '77-'86.	1887.	1886.	1885.	1884.	Diseases.	Av. '77-'86.	1887.	1886.	1885.	1884.	Line Number.
Average..........†	44	37	38	38	48	Average..........†	41	39	36	38	42	Average..........†	41	35	38	39	44	
Neuralgia	80	83	81	78	84	Rheumatism......	84	86	86	83	83	Rheumatism	86	83	88	86	90	1
Rheumatism	83	82	86	77	85	Neuralgia	83	84	83	82	87	Neuralgia..........	85	80	89	87	90	2
Tonsilitis...........	68	70	69	71	73	Tonsilitis	76	81	71	80	79	Tonsilitis	81	79	85	83	82	3
Bronchitis..........	71	69	64	68	72	Bronchitis.........	79	76	74	72	79	Bronchitis..........	83	76	78	80	83	4
Diarrhea............	78	69	73	67	91	Consump., Pul....	72	63	63	65	67	Consump., Pul....	71	56	62	67	69	5
Intermitt. Fever..	88	64	76	74	84	Intermit. Fever..	82	62	64	69	74	Intermit. Fever..	76	54	61	68	74	6
Consump., Pul	72	58	58	63	80	Diarrhea...........	56	58	57	53	67	Influenza..........	61	51	54	55	64	7
Remitt'nt Fever..	70	54	45	53	70	Erysipelas.........	40	57	40	45	45	Diarrhea...........	47	49	52	55	60	8
Erysipelas..........	40	42	42	36	50	Influenza	56	53	51	51	51	Pneumonia	68	48	66	52	61	9
Typho-mal. Fev..	59	41	39	36	57	Pneumonia........	55	53	43	39	45	Remit'nt Fever..	57	47	41	50	64	10
Influenza	46	39	37	43	50	Remit'nt Fever ..	63	45	46	55	58	Erysipelas........	43	44	44	54	45	11
Inflam. of Kidney	37	38	28	38	42	Inflam.of Kidney	34	34	33	32	38	Inflam.of Bowels	28	30	34	34	34	12
Dysentery	47	32	44	28	73	Diphtheria........	44	33	28	32	33	Inflam.of Kidney	36	29	39	34	42	13
Pneumonia	39	31	27	33	43	Typho-mal. Fev.	46	28	35	34	45	Diphtheria........	44	22	29	33	38	14
Typhoid F. (ent.).	35	26	29	23	40	Inflam.of Bowels	27	26	24	28	27	Scarlet Fever.....	32	22	23	21	30	15
Diphtheria.........	42	25	25	34	30	Typhoid F. (ent.).	31	22	22	28	33	Dysentery.........	15	19	15	15	19	16
Inflam. of Bowels	30	24	34	32	34	Whooping-cough	27	20	27	21	19	Measles	14	18	11	8	6	17
Cholera Morbus..	33	23	28	24	56	Dysentery	23	19	25	20	33	Typho-mal. Fev.	35	17	28	23	39	18
Whooping-cough.	27	20	26	22	23	Membran. Croup	20	19	21	11	21	Typhoid F. (ent.)	24	16	18	14	23	19
Scarlet Fever......	27	16	20	22	18	Scarlet Fever.....	28	18	16	21	17	Membran. Croup	22	14	22	10	27	20
Cholera Infant.....	27	13	31	17	42	Cholera Morbus.	15	16	13	15	24	Inflam. of Brain.	12	13	17	16	9	21
Inflam. of Brain..	10	12	8	10	11	Measles............	10	16	10	6	6	Cholera Morbus.	13	12	13	12	23	22
Membran. Croup.	14	11	19	8	15	Puerperal Fever.	12	12	10	12	12	Whooping-cough	27	12	25	23	25	23
Measles.............	8	10	8	2	7	Inflam. of Brain.	11	9	8	11	14	Puerperal Fever.	11	11	14	17	17	24
Puerperal Fever..	12	10	13	10	14	Cholera Infant....	10	8	12	8	18	Cholera Infant....	5	5	6	6	10	25
Cer.-spinal Men....	10	5	8	8	11	Cer.-spinal Men.	7	6	7	5	9	Cer.-spinal Men.	8	4	8	8	14	26
Small-pox..........	0.7	0	1	0	0	Small-pox..........	1	0	1	0	0	Small-pox..........	2	0	1	0	0	27
Observers.........§	82	118	118	133	74	Observers.........§	84	112	112	130	78	Observers.........§	83	105	105	121	77	

*, †, ‡. See notes with these marks on page 94.
§ For this foot-note see page 96.

TABLE 2.—WEEKLY REPORTS OF DISEASES IN MICHIGAN IN 1887.—*Exhibiting for the Year and for each Month of the Year Ending Saturday, January 1, 1887, a Summary relative to Diseases in the State of Michigan; also for each Month a Summary relative to Diseases in each of 11 Geographical Divisions* of the State.—Indicating the Prevalence as regards Time and Area. Compiled from 4,896 Weekly Reports by 155 Observers, Health Officers of Cities and Villages, Regular Correspondents of the State Board of Health, and other Physicians, Reporting the Diseases under their observation.*

Number of Observers, Reports, Etc.	Diseases.	(Av.b) Per Cent of Observers reporting Presence of.	Average Per Cent. of Weeks Reported Present where Present.c	Per Cent of Reports Stating Presence of.d	Average Order of Prevalence where Present.e	Average Order of Prevalence where Present.										
						1886.	1885.	1884.	1883.	1882.	1881.	1880.	1879.	1878.	1877.	Av. 1877-1886.
Year Ending December 31, 1887.† Average number of localities represented, 127. Whole number of Observers during the year, 155. Average number per month, 100. Total number of reports compiled, 4,896. per Month, 408.	Average for tabulated diseases reported present.	37	67	25	3.7	3.7	3.8	4.2	4.2	4.2	4.9	4.7	4.7	4.4	4.1	......
	Brain, Inflammation of	15	43	6	6.2	5.9	6.0	6.4	6.6	6.6	8.7	8.1	......	......	......	......
	Bowels, Inflammation of	32	49	16	5.0	5.0	5.1	5.8	6.1	6.0	7.4	7.0	......	......	......	......
	Bronchitis	69	79	55	3.0	3.0	3.1	3.2	3.2	3.3	3.9	3.7	3.6	3.3	2.3	3.3
	Cerebro-Spinal Meningitis	7	46	3	7.8	7.3	6.9	6.9	7.4	7.2	7.9	7.1	7.4	5.9	6.0	7.0
	Cholera Infantum	24	55	13	4.1	3.9	4.6	4.8	4.8	4.9	5.1	5.2	5.4	5.7	4.9	4.9
	Cholera Morbus	33	57	19	3.8	4.2	4.5	4.9	5.0	5.2	5.3	5.3	5.3	5.7	4.7	5.0
	Consumption, Pulmonary	60	83	51	3.7	3.9	4.0	4.3	4.5	4.6	5.6	5.7	5.6	5.2	5.1	4.9
	Croup, Membranous	10	42	4	6.8	6.2	6.1	7.1	7.1	7.0	8.2	7.4	6.6	7.1	6.1	6.9
	Diphtheria	18	52	10	4.4	4.2	4.7	5.1	5.4	4.8	5.6	5.7	5.4	5.4	5.3	5.2
	Diarrhea	65	73	48	3.0	3.2	3.3	3.3	3.7	3.8	3.9	4.2	4.4	4.2	3.8	3.8
	Dysentery	33	57	19	4.3	4.5	5.0	5.0	5.2	5.3	5.1	5.8	6.2	5.9	4.9	5.3
	Erysipelas	44	52	24	4.7	4.5	4.6	5.2	5.5	5.5	6.2	6.3	6.5	6.4	5.8	5.7
	Fever, Intermittent	64	74	48	2.8	2.6	2.4	2.5	2.3	2.0	2.4	2.3	2.2	2.1	2.2	2.3
	Fever, Remittent	46	69	32	3.4	3.3	3.2	3.3	3.3	3.8	3.5	3.3	3.8	3.1	3.1	3.3
	Fever, Typhoid (Enteric)	15	63	10	4.5	4.7	4.7	5.2	5.1	5.1	6.2	6.5	7.0	7.0	5.5	5.7
	Fever, Typho-malarial	26	59	16	4.1	4.2	4.4	4.6	4.8	4.9	5.2	5.5	5.8	5.4	4.7	5.0

HENRY F.
VAUGHAN
LIBRARY

For the	Whole number of Localities sented per month, 87. age number of observers Average No. of Reports	Influenza	46	71	33	3.0	2.7	2.9	3.3	3.2	3.1	3.5	3.0	3.1	3.1	3.0	3.1
		Kidney, Inflammation of	32	55	18	4.9	4.7	4.4	5.0	......	......	......	......	......	......	......	......
		Measles	22	61	14	3.6	5.0	6.4	5.2	3.7	4.9	4.4	4.8	4.7	5.3	5.0	4.9
		Neuralgia	83	80	67	2.8	2.8	2.8	3.3	3.3	3.6	4.3	4.5	4.5	......	......	......
		Pneumonia	46	60	28	4.3	4.0	4.4	4.5	4.7	4.4	5.4	5.1	5.2	4.8	4.0	4.7
		Puerperal Fever	14	41	6	5.7	5.9	6.3	6.9	7.3	6.2	8.2	7.8	7.2	6.3	6.1	6.8
		Rheumatism	82	83	69	3.2	3.2	3.2	3.6	3.7	3.8	4.6	4.6	4.6	4.2	4.0	4.0
		Scarlatina	15	51	8	5.0	4.5	5.0	5.2	5.2	4.9	6.7	6.5	5.5	5.4	4.8	5.4
		Small-pox	0.01	25	0.02	26.0	25.9	8.4	26.0	14.0	9.1	8.9	6.3	10.6	3.9	6.8	12,0
		Tonsilitis	68	68	47	3.4	3.4	3.5	3.7	3.9	3.9	4.5	4.4	4.5	......	......	......
		Whooping-cough	24	59	14	4.2	3.7	4.1	4.5	5.2	4.4	6.3	5.5	4.7	4.8	5.1	4.8

---

* For Counties in each Division, see Exhibit I., page 85

† For number of Observers, reports, weeks in each month, etc., see Exhibit III., page 88; for names of observers, and number of reports received from each, see Exhibit V., pages 92-94.

[a] Not every one of the observers sent in a report for every week, so that the number of reports received does not equal the number of observers multiplied by the number of weeks.

[b] The numbers in this column (pages 98, 99) state not what per cent of the whole number of observers for the year reported the disease present at some time during the year, but the average (for the twelve months) of the per cents (of observers making reports for the several months) by which the disease was reported present in those months. The column for the year is thus a statement for an average *month*. But on pages 100 and 101 the numbers in the "Per Cent of Observers" column are statements for the month, and not averages. This column indicates the Area of Prevalence, except that in a few instances there were two or more observers in one city or village.

[c] This column states for the year or given month, what per cent the number of reports which stated a disease to be present is of the number of card-reports received, for the given time, from such of the observers as reported the disease present. It is therefore an average not for all localities represented, but only for those at which the given disease was reported present. In the line "Average for Tabulated Diseases" it states what per cent the number of times *all* diseases were reported present is of the number of times they *might have been* so reported on the cards received, for the time specified, from the observers who during that time reported the diseases present (that is, if each of the observers had on every card he sent reported every disease present which he reported present at all). It will be seen that this is a more accurate average than would be obtained by dividing the sum of the column by the number of diseases reported present.

[d] This column states what per cent the number of reports stating presence of a disease is of the whole number of reports received for the time specified, from *all observers* in the State or Division, as the case may be. It combines, and states in a general way, an idea of the *time* a disease was prevalent, with an idea of the area of its prevalence. Had every observer sent a report every week of the month or year, the numbers in this column would be (for the State) the product of the numbers in the same line in the two preceding columns.

[e] The disease having the greatest number of cases was to be marked 1 in the order; the disease having the next greatest number of cases, 2; and so on. Diseases not present were to be marked 0. The numbers in this column are found by dividing the totals (for the State) of the Order of Prevalence column, in Table 3 (a table giving statements for each locality, omitted in printing this Report, for want of room), by the number of men who reported the disease present. The column is, therefore, an average not for all the localities represented but only for those at which the given disease was reported present. The numbers in the "Average" lines for this column are found by dividing the sum of the totals in the Order of Prevalence columns, in Table 3, for all diseases reported present, by the sum of the numbers of men who reported the different diseases present, thus counting each man once for every disease he reported present. As a rule, small numbers in this column indicate a large prevalence of the disease, and *vice versa*; but the greater the number of diseases reported present by each observer from week to week, the greater will be the "average" in this column.

TABLE 2.—CONTINUED.—*Diseases in the State, 1887. (For foot-notes and full tabular heads, see pages 98–99.)*

Month. †	Diseases.	Per ct. of Observers Reporting Pres. of. b	Av. per ct. of Weeks Reported Present where Present a, c	Per cent of Reports Stating Pres. of d	Av. Order of Prevalence where Pres. e	Month. †	Per ct. of Observers Reporting Pres. of. b	Av. per ct. of Weeks Reported Present where Present. a, c	Per. cent of Reports Stating Pres. of. d	Av. Order of Prevalence where Pres. e	Month. †	Per ct. of Observers Reporting Pres. of. b	Av. per ct. of Weeks Reported Present where Present a, c	Per cent of Reports Stating Pres. of. d	Av. Order of Prevalence where Pres. e	Month. †	Per ct. of Observers Reporting Pres. of b	Av. per ct. of Weeks Reported Present, where present. a, c	Per cent of Reports stating Pres. of. d	Av. order of Prevalence, where Pres. e	Month. †	Per ct. of Observers Reporting Pres. of b	Av. per ct. of Weeks Reported Present, where present, a, c	Per cent of Reports stating Pres. of d	Av. order of Prevalence, where Pres. e	Month. †	Per ct. of Observers Reporting Pres. of b	Av. per ct. of Weeks Reported Present, where present, a, c	Per cent of Reports stating Pres. of. d	Av. order of Prevalence, where Pres. e
	Av. for Tab. Dis. Rep. Pres.	38	69	26	3.9		38	72	27	4.0		39	71	28	4.1		37	71	26	3.9		37	68	25	3.7		38	63	24	3.5
January. †	Brain, Inflammation of	20	46	9	7.0	February. †	21	41	9	5.8	March. †	16	38	6	6.6	April. †	11	55	5	6.8	May. †	15	49	8	5.5	June. †	21	37	8	5.1
	Bowels, Inflammation of	28	55	16	5.4		28	56	16	6.0		33	50	17	5.8		27	52	11	5.8		30	52	16	4.8		36	42	15	4.2
	Bronchitis	76	88	67	2.6		79	86	69	2.7		76	87	67	2.5		75	82	62	2.6		72	80	57	3.0		70	70	49	3.1
	Cerebro-spinal Meningitis	7	33	2	8.3		8	41	3	8.5		7	34	2	7.5		7	56	3	8.8		10	49	5	7.6		10	44	4	5.6
	Cholera Infantum	8	39	3	4.1		8	39	3	4.1		3	53	2	5.0		5	29	1	4.5		13	38	5	6.4		26	49	13	5.0
	Cholera Morbus	10	36	4	4.1		9	37	3	5.2		9	31	3	5.4		11	42	4	6.2		27	46	13	5.5		52	49	25	3.6
	Consumption, Pulmonary	63	83	53	3.9		66	80	54	3.9		69	89	61	4.0		67	91	61	3.8		61	88	54	3.4		56	85	48	3.3
	Croup, Membranous	22	47	10	6.2		13	45	6	6.1		10	40	4	6.4		15	36	6	5.9		10	46	5	5 9		4	40	2	7.5
	Diphtheria	26	51	13	4.0		19	53	11	5.2		20	55	11	5.5		9	55	5	4.9		12	56	6	5.0		13	37	5	3.2
	Diarrhea	46	61	28	4.2		47	67	32	4.1		48	63	31	4.6		49	65	32	4.3		48	73	36	3.7		77	68	52	2.8
	Dysentery	15	49	7	6.9		13	57	8	6.1		21	47	10	5.8		12	74	8	6.0		20	54	11	5.6		30	45	14	4.6
	Erysipelas	45	51	23	5.1		49	57	28	5.3		52	61	32	5.2		52	55	29	5.0		46	55	27	4.4		44	53	23	4.4
	Fever, Intermittent	59	66	39	3.2		57	73	42	3.5		62	77	48	3.4		65	76	50	3.1		71	72	52	2.6		69	76	52	2.3
	Fever, Remittent	43	66	29	4.2		35	74	26	4.3		45	59	27	4.1		41	69	30	3.6		43	67	30	3.3		44	68	30	3.0
	Fever, Typhoid (Enteric)	10	64	6	4.4		13	75	10	5.3		7	64	4	6.7		5	53	3	6.8		5	71	3	7.2		9	41	4	4.6
	Fever, Typho-malarial	20	52	10	4.6		18	65	12	4.6		17	58	10	4.2		21	45	10	3.8		14	46	6	4.7		17	43	7	4.4
	Influenza	56	83	47	2.4		60	85	52	2.7		62	80	50	2.4		55	76	43	2.7		50	67	34	3.1		40	57	23	3.3
	Kidney, Inflammation of	35	62	22	4.9		37	58	22	4.9		36	63	23	5.6		33	60	21	4.9		34	58	20	5.2		37	53	19	4.4
	Measles	18	61	11	3.3		26	68	17	3.9		37	59	22	3.5		38	56	22	3.9		41	60	25	2 9		29	69	19	2.5
	Neuralgia	87	83	72	2.9		83	87	73	3.0		89	85	76	2.9		84	85	71	2.8		83	80	67	2.6		82	80	66	2.5
	Pneumonia	69	70	48	4.0		71	71	51	3.8		70	72	50	4.3		64	64	41	4.2		58	59	34	4.0		34	46	16	4.4
	Puerperal Fever	11	41	5	7.4		13	39	5	6.2		20	35	7	6.2		16	50	8	5.3		9	51	5	5.7		17	40	7	5.7
	Rheumatism	87	87	76	3.2		83	88	74	3.4		85	90	77	3.2		86	89	77	3.1		81	87	71	2.9		84	83	70	2.8

	July.†				August.†				September.†				October.†				November.†				December.†			
Scarlatina	21	51	11	4.8	21	53	11	3.7	26	47	12	6.3	14	74	10	6.7	10	56	[illegible]	[illegible]	[illegible]	[illegible]	4	[illegible]
Small-pox	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tonsilitis	74	75	56	3.3	76	78	59	3.3	80	77	61	3.4	76	70	53	3.5	69	66	46	3.4	63	58	37	3.3
Whooping-cough	21	57	12	4.5	21	72	15	4.5	25	59	15	4.6	24	54	13	4.9	26	60	16	3.9	27	50	15	3.3
Av. for Tab. Dis. Rep. Pres.	39	69	27	3.8	44	65	29	3.7	38	67	26	3.7	37	67	25	3.7	39	62	24	3.6	35	68	24	3.5
Brain, Inflammation of	14	50	7	5.8	14	42	6	5.9	10	46	5	6.5	12	38	5	6.2	9	33	3	7.1	13	48	6	6.6
Bowels, Inflammation of	37	53	20	5.0	48	43	21	4.7	33	49	17	4.3	24	50	13	5.6	26	42	11	5.6	30	50	15	4.1
Bronchitis	55	72	41	3.9	55	70	38	3.9	59	79	47	3.5	69	83	57	3.2	76	74	57	2.7	76	81	61	2.5
Cerebro-spinal Meningitis	8	42	3	8.4	8	49	4	7.7	4	69	3	11.5	5	58	3	9.2	6	41	3	8.5	4	50	2	3.8
Cholera Infantum	65	67	44	3.3	73	60	45	3.5	39	51	21	4.2	13	48	6	5.2	8	33	3	5.3	5	30	2	7.0
Cholera Morbus	76	76	59	3.0	78	71	55	3.1	55	56	31	4.0	23	43	10	4.0	16	26	4	5.4	12	36	4	4.2
Consumption, Pulmonary	56	83	48	4.0	61	75	47	4.0	51	86	45	3.7	58	84	48	3.6	63	76	47	3.3	56	89	50	3.5
Croup, Membranous	2	63	1	17.0	4	40	2	8.8	5	40	2	8.6	11	40	4	6.9	19	41	8	6.6	14	40	6	7.2
Diphtheria	13	41	5	4.1	13	44	6	4.8	14	46	7	4.8	25	63	16	4.2	33	58	19	3.3	22	53	12	4.3
Diarrhea	94	87	82	1.7	96	88	85	1.6	86	81	71	2.4	69	67	46	3.0	58	58	34	3.6	49	61	30	3.9
Dysentery	65	56	36	3.7	80	69	55	3.2	58	61	37	3.7	32	55	18	4.8	19	38	7	5.1	19	49	9	3.8
Erysipelas	35	49	17	5.5	39	44	18	4.6	33	51	18	4.7	42	50	21	4.6	57	46	26	3.9	44	55	25	4.3
Fever, Intermittent	65	80	53	2.5	71	77	55	2.8	70	74	53	2.7	64	78	50	2.5	62	68	42	2.6	54	70	39	2.9
Fever, Remittent	44	68	31	3.4	55	72	40	3.2	55	69	41	2.9	54	77	42	3.1	45	69	31	2.8	47	67	31	3.1
Fever, Typhoid (Enteric)	11	70	8	4.5	27	53	14	4.6	32	68	22	3.8	26	68	18	3.8	22	67	15	3.7	16	63	11	4.9
Fever, Typho-malarial	22	61	13	5.6	43	60	27	4.0	49	64	33	3.5	41	70	30	3.4	28	61	17	4.0	17	56	9	4.1
Influenza	24	55	13	4.7	33	54	18	3.7	40	65	27	3.6	39	72	28	3.5	53	68	35	3.0	51	74	38	2.8
Kidney, Inflammation of	24	52	13	6.0	28	42	12	5.1	23	57	14	4.6	38	49	18	4.3	34	47	16	4.5	29	59	17	4.6
Measles	24	64	15	3.6	11	55	6	4.9	5	83	4	6.0	10	57	5	4.9	16	55	9	3.8	18	59	11	4.2
Neuralgia	79	78	62	3.3	83	71	59	3.4	85	77	65	2.8	83	79	66	2.7	84	79	66	2.6	80	82	65	2.6
Pneumonia	21	49	10	4.7	19	41	8	5.0	28	47	14	5.2	31	53	17	4.7	53	53	28	4.3	48	63	31	4.1
Puerperal Fever	12	46	6	5.4	16	43	7	5.5	16	38	7	5.6	10	34	3	5.6	12	32	4	6.6	11	45	5	2.9
Rheumatism	76	73	57	3.6	81	73	61	3.8	75	86	66	3.3	82	81	66	3.2	86	80	69	2.9	83	85	70	2.8
Scarlatina	5	67	3	6.0	12	32	4	5.3	13	55	7	4.7	16	54	9	4.8	18	55	10	4.2	22	48	11	3.4
Small-pox	0	0	0	0	0	0	0	0	1	25	0.3	26.0	0	0	0	0	0	0	0	0	0	0	0	0
Tonsilitis	45	64	29	3.8	56	55	31	4.1	56	66	38	3.8	70	67	47	3.3	81	67	54	2.8	79	72	57	2.8
Whooping-cough	33	70	22	4.1	32	56	18	4.3	20	55	11	4.0	20	43	9	3.9	20	52	10	4.2	12	70	9	5.1

TABLE 2.—CONTINUED.—*Diseases in the Upper Peninsular, the Northwestern, the Northern, and the Northeastern Divisions of the State for the years 1877-1886, and by Months in 1887,—Indicating what Per Cent of the Weekly Reports Received Stated the Presence of the Diseases Named.*d

Div.*	Diseases.	'77-'86.‡	1887.†	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Div.*	'77-'86.‡	1887.†	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Upper Peninsular Division.*	Av. for Tab. Dis. Rep. Pres.	30	30	43	46	45	47	52	40	39	38	40	39	41	42	Northwestern Division.*	33	31	50	53	83	41	36	38	46	45	48	47	40	49
	Brain, Inflammation of	7	11	25	0	21	45	18	9	0	10	0	0	0	19		3	10	0	0	0	0	0	10	38	20	13	38	0	0
	Bowels, Inflammation of	20	15	0	0	29	0	0	0	19	35	6	7	25	38		8	4	0	0	0	0	0	10	13	20	0	0	0	0
	Bronchitis	72	88	100	100	100	100	100	83	69	70	88	100	95	75		60	57	75	57	100	57	50	60	50	50	50	50	50	50
	Cerebro-spinal Meningitis	3	1	0	0	7	9	0	0	0	0	0	0	0	0		3	1	0	0	0	0	0	0	0	10	0	0	0	0
	Cholera Infantum	13	6	0	8	0	0	0	4	25	25	0	0	5	0		23	24	0	0	0	0	25	40	88	70	38	0	0	0
	Cholera Morbus	17	37	25	33	36	27	45	30	63	65	44	40	15	13		23	13	0	0	0	0	13	30	50	50	0	0	0	0
	Consumption, Pulmonary	75	53	67	75	93	64	55	61	44	25	19	20	60	69		40	53	50	57	100	43	50	50	50	50	50	50	50	50
	Croup, Membranous	6	4	8	0	0	9	18	0	0	0	0	0	10	6		8	2	0	0	0	0	0	10	13	0	0	0	0	0
	Diphtheria	9	15	33	33	14	9	9	0	6	0	13	13	35	25		17	5	12	0	40	14	0	0	0	0	0	0	10	0
	Diarrhea	60	84	92	67	64	91	100	91	100	100	81	87	70	69		60	40	0	57	80	43	50	50	75	60	38	0	20	25
	Dysentery	23	13	8	0	0	9	9	26	25	35	0	13	10	0		31	33	0	29	60	43	38	40	75	60	50	0	0	13
	Erysipelas	24	26	0	25	29	36	45	26	25	20	25	7	45	25		34	29	50	29	60	43	50	10	13	30	13	25	10	38
	Fever, Intermittent	9	4	8	0	0	0	0	0	0	0	0	27	10	0		79	56	50	57	100	43	50	60	50	70	50	50	50	50
	Fever, Remittent	15	3	0	0	0	9	0	17	0	0	0	0	0	0		41	53	50	57	100	43	50	50	50	50	50	50	50	50
	Fever, Typhoid (Enteric)	29	44	58	58	29	0	0	0	31	50	63	80	80	63		9	21	0	0	0	0	13	0	0	40	50	50	50	25
	Fever, Typho-malarial	5	0	0	0	0	0	0	0	0	0	0	0	0	0		30	22	0	0	0	0	13	0	25	70	63	63	10	0
	Influenza	49	11	33	33	43	36	18	0	0	0	0	0	0	0		48	53	50	57	100	43	50	50	50	50	50	50	50	50
	Kidney, Inflammation of	55	27	42	33	43	36	45	35	13	15	19	13	15	38		35	8	13	14	0	14	25	20	13	0	0	0	0	0
	Measles	17	32	0	0	14	55	64	35	44	25	25	33	50	38		15	16	50	57	80	14	13	10	0	0	0	13	0	0
	Neuralgia	45	61	50	50	71	100	73	61	56	65	69	60	60	31		73	63	63	71	100	43	50	70	63	50	63	63	50	88
	Pneumonia	40	34	33	42	57	55	91	30	19	10	6	13	25	69		39	64	75	100	100	57	38	70	50	60	75	50	60	50
	Puerperal Fever	5	15	25	17	36	36	0	0	0	0	0	7	25	50		5	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rheumatism	65	73	83	100	100	100	100	74	63	35	69	73	65	50		73	64	75	57	100	71	50	50	63	60	75	63	60	63
	Scarlatina	28	15	17	17	14	0	18	17	0	15	13	20	25	13		23	11	38	29	20	29	13	10	0	10	0	0	0	0
	Small-pox	0.6	0	0	0	0	0	0	0	0	0	0	0	0	0		1	0	0	0	0	0	0	0	0	0	0	0	0	0

	Tonsilitis	36	66	83	75	64	73	73	39	19	40	63	93	100	94		59	65	50	71	100	80	50	60	50	50	50	50	70	88
	Whooping-cough	25	4	25	8	0	0	0	0	0	0	0	0	0	19		20	5	0	0	0	14	25	0	0	10	0	0	10	0
	Av. for Tab. Dis. Rep. Pres.	18	14	20	30	24	26	25	26	27	27	25	20	22	20		30	25	40	44	51	40	33	29	35	41	33	41	44	37
Northern Division.*	Brain, Inflammation of	3	1	0	0	0	0	10	0	0	0	0	5	0	0	Northeastern Division.*	4	5	8	8	13	0	7	12	5	0	0	0	0	0
	Bowels, Inflammation of	3	7	0	0	0	14	0	15	11	9	13	10	4	0		23	15	17	25	27	9	13	12	25	37	6	13	0	0
	Bronchitis	45	26	0	11	0	43	60	15	22	26	19	40	38	30		84	70	100	92	100	73	53	64	45	74	50	69	74	71
	Cerebro-spinal Meningitis	2	1	0	0	0	0	0	0	0	0	0	0	0	5		4	1	0	0	0	0	0	4	0	0	0	0	0	0
	Cholera Infantum	5	12	0	0	0	0	0	0	50	48	13	0	0	0		11	11	8	17	27	0	0	24	45	0	0	0	0	0
	Cholera Morbus	3	14	0	0	0	14	20	23	33	35	19	10	0	5		14	13	0	8	0	0	0	20	40	47	13	0	0	0
	Consumption, Pulmonary	16	22	9	33	8	0	30	31	22	26	25	20	25	25		65	48	67	58	67	36	27	32	50	53	50	50	47	50
	Croup, Membranous	1	2	17	0	0	0	0	0	0	0	0	0	8	0		10	3	8	8	20	0	0	0	0	0	10	0	0	0
	Diphtheria	9	3	9	0	0	0	0	0	0	4	0	5	13	0		12	2	8	0	0	0	0	0	0	5	13	0	0	0
	Diarrhea	36	28	0	0	0	14	10	31	50	83	44	15	21	10		67	70	67	83	87	55	33	64	90	89	63	75	68	50
	Dysentery	21	15	0	0	0	0	0	0	50	57	6	10	8	0		27	26	25	8	27	0	27	20	45	47	44	31	16	7
	Erysipelas	8	7	9	0	8	14	20	0	0	0	13	20	8	0		24	26	25	42	40	36	27	28	35	11	19	13	21	21
	Fever, Intermittent	27	36	27	56	33	14	20	38	33	43	38	35	42	35		19	33	8	33	7	9	20	36	25	37	50	50	53	50
	Fever, Remittent	4	13	0	0	8	14	10	8	6	30	31	20	8	5		25	5	8	0	0	18	7	4	5	0	6	19	0	0
	Fever, Typhoid (Enteric)	11	5	0	0	0	0	0	0	0	13	31	10	0	0		4	2	0	0	0	0	0	0	0	11	0	6	0	0
	Fever, Typho-malarial	10	2	0	0	0	0	10	0	0	0	0	0	0	10		10	3	0	0	0	9	7	0	0	0	6	13	0	0
	Influenza	29	16	0	0	0	57	20	15	0	17	19	25	25	20		31	39	33	33	33	64	40	32	25	32	31	50	47	57
	Kidney, Inflammation of	7	3	0	0	0	0	0	0	0	4	0	5	8	5		38	22	25	58	40	9	13	8	15	16	25	25	26	14
	Measles	11	2	0	0	0	0	0	15	0	0	0	0	0	10		9	3	0	0	0	18	0	12	0	0	0	0	0	7
	Neuralgia	53	30	0	22	25	14	50	46	28	13	44	35	46	25		89	75	100	100	100	100	80	64	60	68	75	75	63	50
	Pneumonia	23	14	27	0	8	29	0	31	6	0	19	15	17	25		37	27	67	67	80	27	27	16	5	5	13	19	32	7
	Puerperal Fever	8	3	0	11	8	14	0	0	6	9	0	0	0	0		4	4	17	17	7	0	0	0	0	0	13	0	5	0
	Rheumatism	58	38	18	0	42	43	40	38	39	48	50	40	29	45		81	69	92	92	87	73	67	56	50	68	81	69	58	57
	Scarlatina	4	2	18	0	0	0	0	0	0	4	6	0	0	0		8	2	0	8	0	0	0	0	0	0	0	0	0	14
	Small-pox	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	9	0	0	0	0	0	0	0	0	0	0
	Tonsilitis	28	40	45	56	67	57	20	31	22	30	31	45	54	40		73	65	83	83	100	64	87	44	45	58	50	81	58	5
	Whooping-cough	10	9	0	22	33	0	0	23	22	4	0	15	0	0		6	3	0	0	0	0	0	0	20	0	13	0	0	0

---

*, †, d. See page 99. ‡Inflammation of kidney was not compiled until 1884. For inflammation of brain and inflammation of bowels, an average for the 7 years, 1880-6; for neuralgia and tonsilitis, an average for the 8 years, 1879-86; for other diseases and for the average line, an average for the 10 years 1877-86. For the Northern Division 1882-86. For the Northeastern Division 1883-86.

TABLE 2.—CONTINUED.—*Diseases in the Western, Northern Central, Bay and Eastern, and the Central Divisions of the State, for the Years 1877–1886, and by Months in 1887, indicating what Per Cent of the Weekly Reports Received Stated the Presence of the Diseases Named.*[d]

Div.*	Diseases.	'77–'86.‡	1887.†	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Div.*	'77–'86.‡	1887.†	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Western Division.*	Av. for Tab. Dis. Rep. Pres....	32	28	32	32	36	34	29	30	38	39	32	31	32	34	Northern Central Division.*	29	21	28	30	39	31	25	25	33	34	30	31	26	31
	Brain, Inflammation of........	4	6	20	9	8	4	0	8	6	0	0	0	3	17		3	4	0	6	0	0	5	10	4	4	0	13	5	0
	Bowels, Inflammation of	17	16	14	25	32	4	19	10	23	20	15	7	9	17		5	4	0	0	0	7	5	3	8	7	5	0	0	0
	Bronchitis......................	55	56	74	78	74	72	33	45	45	45	50	45	49	67		52	43	50	63	60	36	35	31	33	36	38	53	53	55
	Cerebro-spinal Meningitis....	4	1	6	0	0	0	4	0	0	0	0	0	0	0		9	3	0	6	0	0	10	7	8	0	0	0	0	0
	Cholera Infantum..............	17	9	0	0	0	0	0	3	48	43	12	0	0	0		12	16	0	0	0	0	5	14	58	43	24	0	0	0
	Cholera Morbus................	21	18	3	3	3	0	7	33	61	60	15	0	3	17		17	22	13	13	0	0	15	28	67	50	19	7	0	0
	Consumption, Pulmonary	49	39	40	44	66	56	30	33	45	33	35	41	23	17		36	32	13	19	47	64	25	31	38	43	33	20	37	9
	Croup, Membranous............	6	9	14	3	3	16	15	0	0	0	4	14	29	17		10	1	0	6	0	0	0	0	0	0	0	0	0	9
	Diphtheria.......................	27	9	0	9	13	12	4	0	10	0	4	21	20	17		31	4	13	13	0	0	0	3	8	0	0	0	5	0
	Diarrhea..........................	47	48	37	31	21	20	26	50	94	93	73	41	34	46		48	44	31	31	13	14	45	62	88	79	52	20	11	9
	Dysentery.........................	26	14	6	16	5	0	4	10	23	53	31	7	0	0		18	17	0	0	0	14	20	21	29	43	29	7	0	0
	Erysipelas........................	30	29	9	31	18	20	37	28	23	35	27	34	49	38		31	15	13	31	27	36	15	7	25	14	5	7	11	0
	Fever, Intermittent............	75	64	51	41	58	72	74	73	65	83	69	66	57	54		69	59	44	50	60	64	60	69	75	82	52	60	26	36
	Fever, Remittent...............	65	36	31	28	16	16	26	40	55	48	38	38	49	50		56	45	25	50	47	50	45	38	46	57	48	60	42	27
	Fever, Typhoid (Enteric)......	11	7	0	9	0	4	0	5	0	13	31	17	0	4		10	2	0	0	0	0	0	0	0	0	19	7	0	0
	Fever, Typho-malarial.........	26	19	9	3	0	20	19	10	19	30	50	41	26	17		31	19	6	25	7	7	15	14	17	54	43	0	11	0
	Influenza..	47	36	51	59	66	40	19	18	16	18	19	24	49	54		11	11	19	31	27	7	15	3	0	11	10	13	11	0
	Kidney, Inflammation of......	17	12	9	16	29	28	4	8	10	8	15	14	3	4		7	6	19	6	13	7	10	0	4	4	0	13	5	0
	Measles...........................	13	28	34	41	42	24	48	48	32	5	15	14	23	0		16	7	13	25	7	21	5	0	21	4	0	0	0	0
	Neuralgia.........................	72	84	89	84	87	76	78	90	84	85	85	85	83	79		56	47	44	56	53	30	50	34	46	43	57	53	47	45
	Pneumonia	39	29	46	50	58	60	33	20	0	3	12	0	26	46		32	22	25	31	60	29	30	0	13	0	5	47	32	45
	Puerperal Fever................	7	4	0	3	18	0	0	5	0	0	8	3	9	0		4	9	0	13	0	21	20	17	13	0	14	0	0	0
	Rheumatism......................	62	69	71	78	71	66	70	70	61	60	73	66	83	67		59	59	69	63	67	71	50	59	46	61	52	60	63	55
	Scarlatina........................	25	9	9	22	21	0	0	3	1	3	8	14	11	13		8	2	0	0	0	7	0	0	0	4	10	0	0	0
	Small-pox........................	1	0	0	0	0	0	0	0	0	0	0	0	0	0		1	0	0	0	0	0	0	0	0	0	0	0	0	0

	Tonsilitis	55	54	60	56	53	44	41	58	35	63	54	59	63	58		59	44	56	69	53	50	40	34	38	21	52	60	42	36
	Whooping-cough	16	20	11	28	26	36	11	18	29	30	15	7	17	15		15	15	0	0	0	0	0	17	33	25	24	20	21	18
Bay and Eastern Division.*	Av. for Tab. Dis. Rep. Pres.	34	26	26	26	28	28	25	26	31	30	28	25	24	25	Central Division.*	27	26	26	29	30	26	29	26	29	29	31	25	25	28
	Brain, Inflammation of	7	4	3	7	7	0	2	7	6	7	3	3	2	2		5	5	3	9	1	0	10	9	11	4	0	4	3	2
	Bowels, Inflammation of	21	22	20	20	24	29	23	23	25	28	19	14	12	20		12	18	12	12	10	10	19	14	24	24	27	19	9	26
	Bronchitis	71	55	53	63	64	63	60	47	45	42	43	59	59	66		53	57	76	76	78	60	60	53	44	30	55	48	47	57
	Cerebro-spinal Meningitis	6	2	0	3	1	5	6	2	1	4	2	2	1	3		4	8	3	6	1	3	15	13	11	12	6	7	11	11
	Cholera Infantum	18	15	0	2	3	3	4	16	54	53	19	6	5	5		11	10	3	1	0	3	0	11	28	39	20	6	0	0
	Cholera Morbus	21	20	1	0	1	7	12	31	61	62	33	5	6	3		15	16	1	0	1	3	13	20	48	46	33	17	2	2
	Consumption, Pulmonary	69	48	44	38	40	54	50	44	48	52	59	52	48	46		60	52	61	64	70	50	56	44	41	51	45	48	35	50
	Croup, Membranous	10	4	6	7	7	8	4	0	0	0	2	6	5	10		3	4	15	3	1	5	6	1	0	1	0	6	5	4
	Diphtheria	29	9	17	13	6	3	6	4	0	4	2	19	23	8		22	5	4	3	7	5	6	0	2	3	4	7	5	15
	Diarrhea	51	47	20	32	33	24	27	56	84	82	79	44	32	39		42	45	22	27	21	30	33	51	87	88	76	48	26	20
	Dysentery	20	18	7	7	13	8	2	17	40	49	28	16	5	14		15	14	3	4	1	0	2	9	24	50	45	17	6	4
	Erysipelas	25	23	20	22	29	19	17	22	18	26	19	22	23	31		19	25	25	28	48	33	23	23	6	12	14	28	32	24
	Fever, Intermittent	78	49	31	42	46	47	58	60	60	49	52	62	43	41		73	60	57	58	67	68	60	63	67	62	69	54	53	48
	Fever, Remittent	40	29	26	18	18	31	25	22	19	35	45	37	35	37		47	36	36	31	37	33	48	36	33	34	37	41	35	30
	Fever, Typhoid (Enteric)	9	8	7	5	0	5	8	2	1	14	21	17	14	7		12	12	3	10	1	3	0	6	20	17	24	17	21	22
	Fever, Typho-malarial	30	23	17	27	19	19	8	11	25	27	47	35	22	20		19	18	9	21	24	15	6	11	15	26	39	30	18	4
	Influenza	43	35	51	63	54	34	33	26	16	28	31	27	28	34		36	36	55	55	60	43	40	26	7	16	27	24	37	37
	Kidney, Inflammation of	23	18	14	18	25	19	21	20	13	12	12	21	19	22		21	22	22	19	19	15	21	27	19	20	16	28	24	26
	Measles	15	15	20	22	25	27	19	12	18	11	2	0	10	15		10	7	1	1	3	8	21	16	11	1	4	4	5	9
	Neuralgia	71	64	66	55	65	69	63	65	64	61	66	60	62	68		61	75	75	85	81	65	77	79	70	71	65	78	73	78
	Pneumonia	42	27	43	53	47	53	35	19	3	8	14	13	22	27		33	30	46	55	54	30	31	17	17	12	18	11	24	35
	Puerperal Fever	5	4	1	3	0	10	0	5	4	9	5	2	0	2		5	8	4	4	3	0	10	19	7	9	12	9	10	4
	Rheumatism	76	65	70	67	64	80	69	72	57	53	57	57	64	73		61	67	72	76	79	75	65	61	61	61	65	59	66	67
	Scarlatina	19	6	13	7	7	19	2	1	0	5	0	2	5	8		13	3	4	4	7	0	0	1	0	0	8	7	0	0
	Small-pox	1	0	0	0	0	0	0	0	0	0	0	0	0	0		0.4	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tonsilitis	53	39	50	43	42	44	50	36	28	27	29	35	48	44		41	36	52	63	63	28	23	23	11	18	22	24	31	63
	Whooping-cough	26	16	13	18	24	20	17	17	19	11	14	17	11	8		18	13	9	18	4	3	19	20	24	25	20	6	6	0

*, †. d. See page 99. ‡ Inflammation of kidney was not compiled until 1884. For inflam. of brain, and inflam. of bowels, an average for the 7 years 1880–6; for neuralgia and tonsilitis, an av. for the 8 years 1879–86; for other diseases, and for the av. line, an av. for the 10 years 1877–86.

TABLE 2.—CONTINUED.—*Diseases in the Southwestern and Southern Central Divisions of the State, for the years 1877–86, and by Months in 1887,—Indicating what Per Cent of the Weekly Reports Received Stated the Presence of the Diseases Named.*[d]

Div.*	Diseases.	'77–86.‡	1887.†	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Div.*	'77–86.‡	1887.†	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
	Av. for Tab. Dis. Rep. Pres.	29	24	27	28	29	36	25	23	28	30	29	27	27	26		29	28	27	29	31	33	35	26	29	31	32	30	30	27
Southwestern Division.*	Brain, Inflammation of	4	5	15	13	2	0	8	2	2	4	2	0	0	6	Southern Central Division.*	4	6	6	5	4	3	10	6	4	7	7	6	3	5
	Bowels, Inflammation of	10	9	13	13	7	0	4	9	19	11	12	11	2	9		15	15	16	13	14	18	22	17	18	15	16	9	18	12
	Bronchitis	54	40	60	63	62	67	45	27	21	17	34	34	33	38		65	56	64	59	58	60	65	52	35	47	46	69	63	62
	Cerebro-spinal Meningitis	2	1	5	5	0	0	0	4	0	2	0	0	0	0		4	1	1	0	2	0	0	1	1	2	4	3	0	0
	Cholera Infantum	20	16	8	8	0	0	10	16	43	50	22	14	0	3		11	14	3	1	0	0	6	13	45	42	40	7	9	1
	Cholera Morbus	15	18	0	5	2	0	6	20	62	52	37	9	4	3		19	22	4	2	1	0	13	28	73	65	43	14	4	5
	Consumption, Pulmonary	73	49	60	68	56	73	55	36	38	39	34	46	44	50		63	57	50	49	58	68	68	58	59	52	52	56	57	55
	Croup, Membranous	5	2	10	10	0	0	0	0	0	2	0	0	4	3		4	3	11	4	2	3	0	1	0	1	1	1	9	3
	Diphtheria	14	4	3	5	9	0	8	5	2	7	0	0	0	3		15	13	18	11	19	5	6	12	8	10	10	29	21	5
	Diarrhea	39	41	25	30	22	20	29	38	67	80	73	31	29	28		46	49	30	26	33	28	41	55	85	88	79	56	37	23
	Dysentery	13	20	10	10	9	10	8	7	40	61	41	23	11	3		17	21	3	0	12	8	17	8	36	67	48	26	9	21
	Erysipelas	22	20	18	18	31	30	29	24	10	11	5	9	24	31		20	22	28	29	25	29	27	28	13	12	19	19	20	19
	Fever, Intermittent	81	47	40	45	49	57	43	45	48	52	51	54	51	31		77	49	38	39	52	52	58	49	63	63	56	44	38	42
	Fever, Remittent	50	30	28	33	27	13	24	22	21	46	37	34	31	41		54	45	35	29	36	43	36	45	43	59	59	64	43	44
	Fever, Typhoid (Enteric)	6	4	3	5	4	0	0	0	0	6	15	3	7	0		9	6	3	5	0	0	0	3	6	7	16	14	7	7
	Fever, Typho-malarial	21	18	18	13	7	13	8	4	7	26	29	46	31	25		19	14	13	7	9	2	0	4	18	29	27	29	24	7
	Influenza	44	37	38	48	42	57	31	27	24	26	39	40	53	34		37	41	56	59	52	46	46	27	10	12	37	44	47	58
	Kidney, Inflammation of	14	13	18	23	24	13	10	18	14	0	12	9	7	13		19	21	24	22	22	34	29	25	11	11	11	19	20	23
	Measles	9	17	10	15	18	13	20	36	26	17	0	11	13	16		10	12	8	21	32	26	36	14	6	0	0	1	2	1
	Neuralgia	75	64	65	75	67	67	65	69	64	56	63	51	60	66		70	77	83	77	86	80	76	77	69	62	73	80	81	78
	Pneumonia	31	26	68	63	56	37	29	9	5	0	5	3	27	25		36	29	50	50	46	40	36	12	13	5	17	27	36	27
	Puerperal Fever	2	6	8	8	4	7	4	4	5	6	7	3	4	9		3	2	1	0	2	2	4	3	3	7	2	1	0	3
	Rheumatism	75	73	78	73	73	73	80	73	64	69	68	71	78	78		71	79	88	78	88	85	78	85	59	70	80	81	78	78
	Scarlatina	13	8	18	5	11	0	2	4	0	0	12	26	16	13		16	11	13	16	18	18	12	4	8	4	9	10	16	14
	Small-pox	0.7	0	0	0	0	0	0	0	0	0	0	0	0	0		0.5	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tonsilitis	45	42	50	65	62	53	53	31	7	20	24	49	42	59		50	51	56	51	65	62	46	42	44	31	43	49	63	62
	Whooping-cough	15	18	10	10	13	17	14	13	29	31	17	20	20	25		19	12	15	17	16	15	28	18	11	15	1	0	0	0

---

*, †, d. See page 99. ‡ Inflammation of kidney was not compiled until 1884. For inflammation of brain and inflammation of bowels, an average for the 7 years 1880–86; for neuralgia, and tonsilitis an average for the 8 years 1879–86; for other diseases and for average line an average for the 10 years 1877–86.

TABLE 2.—CONTINUED.—*Diseases in the Southeastern Division of the State, for the years 1877–86, and by Months in 1887,—Indicating what Per Cent of the Weekly Reports Received Stated the Presence of the Diseases Named.*[d]

Div.*	Diseases.	'77–'86.‡	1887.†	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Southeastern Division.*	Av. for Tabulated Dis. Reported Present....	35	28	34	35	31	31	28	25	29	32	27	28	27	27
	Brain, Inflammation of	15	15	24	24	14	22	10	14	17	15	16	8	9	14
	Bowels, Inflammation of	22	22	33	29	22	16	22	22	21	28	28	22	11	14
	Bronchitis	67	61	83	86	66	54	69	58	50	28	50	63	64	78
	Cerebro-spinal Meningitis	8	8	5	10	10	14	12	7	8	10	8	8	6	0
	Cholera Infantum	17	14	10	7	4	3	8	9	35	56	14	12	0	3
	Cholera Morbus	24	18	7	2	2	11	16	20	56	52	30	6	7	2
	Consumption, Pulmonary	80	70	81	74	90	86	71	71	60	59	50	65	64	76
	Croup, Membranous	13	9	12	17	12	8	12	7	8	8	10	8	7	7
	Diphtheria	31	21	83	24	16	11	10	9	12	13	20	27	43	31
	Diarrhea	53	48	26	36	36	57	39	42	73	85	62	53	33	28
	Dysentery	27	25	24	24	18	19	16	19	37	61	40	24	9	10
	Erysipelas	33	32	43	45	38	38	31	28	33	23	30	25	30	29
	Fever, Intermittent	71	39	33	29	28	38	49	49	38	43	48	35	33	31
	Fever, Remittent	45	29	29	21	22	27	22	25	35	38	38	47	21	22
	Fever, Typhoid (Enteric)	24	19	19	29	22	8	14	13	19	25	22	25	23	10
	Fever, Typho-malarial	25	11	5	0	2	3	2	9	2	31	36	35	6	2
	Influenza	44	26	43	45	40	49	35	22	12	11	12	12	23	33
	Kidney, Inflammation of	25	22	45	31	18	19	24	20	15	26	24	18	19	12
	Measles	18	15	10	19	30	27	27	17	10	8	8	6	7	21
	Neuralgia	58	59	83	76	76	76	51	43	50	48	52	55	56	59
	Pneumonia	43	26	48	45	40	30	39	12	15	16	8	20	27	28
	Puerperal Fever	10	10	12	10	18	16	8	10	15	15	8	6	3	2
	Rheumatism	73	71	86	83	84	81	69	71	50	61	54	73	74	78
	Scarlatina	29	13	10	17	18	14	16	7	8	8	8	10	17	22
	Small-pox	4	0.2	0	0	0	0	0	0	0	0	2	0	0	0
	Tonsilitis	48	51	60	74	72	70	47	33	31	33	40	51	61	53
	Whooping-cough	29	18	24	12	18	8	10	16	38	21	12	8	21	17

---

*, †, d. See page 99. ‡ Inflammation of kidney was not compiled until 1884. For inflammation of brain and inflammation of bowels, an average for the 7 years 1880–86; for neuralgia and tonsilitis an average for the 8 years, 1879–86; for other diseases and for average line an average for the 10 years 1877–86.

TABLE 4.—*A Summary for the Year 1887, relative to Diseases in each of the Eleven Divisions of the State,†—indicating the prevalence as regards both Time and Area.*

Diseases	Upper Peninsular Div.*				Northwestern Div.*				Northern Div.*				Northeastern Div.*				Northern Central Div.*			
	Per Cent of Observers Reporting Presence of. b	Av. Per Cent of Weeks Reported Present where Present. c	Per Cent of Reports Stating Presence of. d	Av. Order of Prevalence where Present. e	Per Cent of Observers Reporting Presence of. b	Av. Per Cent of Weeks Reported Present where Present. c	Per Cent of Reports Stating Presence of. d	Av. Order of Prevalence where Present. e	Per Cent of Observers Reporting Presence of. b	Av. Per Cent of Weeks Reported Present where Present. c	Per Cent of Reports Stating Presence of. d	Av. Order of Prevalence where Present. e	Per Cent of Observers Reporting Presence of. b	Av. Per Cent of Weeks Reported Present where Present. c	Per Cent of Reports Stating Presence of. d	Av. Order of Prevalence where Present. e	Per Cent of Observers Reporting Presence of. b	Av. Per Cent of Weeks Reported Present where Present. c	Per Cent of Reports Stating Presence of. d	Av. Order of Prevalence where Present. e
Average for Tabulated Diseases Reported Present	43	68	30	3.7	44	69	31	5.1	24	53	14	2.2	36	69	25	3.3	34	62	21	3.5
Brain, Inflammation of	25	42	11	5.6	26	38	10	4.0	4	29	1	3.5	13	36	5	3.8	13	33	4	3.4
Bowels, Inflammation of	32	42	15	4.4	17	21	4	7.5	19	32	7	2.9	43	35	15	4.4	13	29	4	4.0
Bronchitis	98	90	88	2.4	65	86	57	3.7	44	56	26	2.3	80	87	70	2.4	62	70	43	3.1
Cerebro-spinal Meningitis	5	25	1	5.5	4	20	1	1.0	2	25	1	2.0	2	20	1	3.0	9	33	3	4.6
Cholera Infantum	18	34	6	3.9	35	66	24	4.4	17	65	12	2.4	17	63	11	2.5	33	47	16	3.9
Cholera Morbus	59	64	37	3.7	22	57	13	5.2	33	40	14	2.1	22	58	13	3.9	31	69	22	3.2
Consumption, Pulmonary	77	68	53	3.9	52	100	53	9.6	31	66	22	2.6	52	92	48	4.0	51	63	32	4.9
Croup, Membranous	11	35	4	6.2	9	22	2	5.5	4	44	2	2.5	7	38	3	7.0	4	25	1	4.0
Diphtheria	30	54	15	4.0	17	28	5	5.8	8	33	3	2.8	7	31	2	1.7	11	36	4	3.8
Diarrhea	93	91	84	2.5	57	68	40	5.8	44	61	28	1.9	87	79	70	2.7	65	66	44	2.4
Dysentery	32	39	13	4.0	48	68	33	4.8	27	50	15	2.7	43	59	26	4.5	31	54	17	3.4
Erysipelas	48	54	26	4.8	70	42	29	5.7	19	39	7	2.2	48	52	26	3.8	44	34	15	4.7
Fever, Intermittent	9	44	4	4.5	61	89	56	2.2	52	65	36	1.8	41	79	33	2.6	73	81	59	2.5
Fever, Remittent	5	56	3	4.0	52	100	53	3.1	33	36	13	2.3	15	34	5	4.0	64	72	45	2.9
Fever, Typhoid (enteric)	55	79	44	2.8	26	77	21	7.6	8	53	5	2.5	4	33	2	4.5	4	63	2	5.0
Fever, Typho-malarial	0	0	0	0	39	54	22	5.2	4	43	2	1.5	9	31	3	6.8	35	55	19	3.7
Influenza	14	77	11	2.8	52	100	53	4.1	27	57	16	2.5	52	74	39	1.6	24	51	11	2.2
Kidney, Inflammation of	48	57	27	4.3	35	24	8	4.4	8	28	3	3.8	39	54	22	3.9	18	34	6	4.2
Measles	45	72	32	3.2	30	55	16	5.4	6	36	2	1.7	7	46	3	4.3	16	47	7	4.2
Neuralgia	91	67	61	3.9	83	77	63	4.5	52	54	30	2.0	93	81	75	2.9	71	68	47	3.3
Pneumonia	55	63	34	5.3	83	77	64	4.7	25	52	14	2.8	50	54	27	4.7	38	59	22	4.4
Puerperal Fever	25	58	15	4.5	0	0	0	0	10	33	3	2.0	15	27	4	4.0	16	54	9	3.9
Rheumatism	89	82	73	3.7	91	70	64	5.0	56	63	38	2.0	85	81	69	2.8	78	75	59	3.2
Scarlatina	32	44	15	4.3	39	30	11	8.4	6	40	2	1.7	4	38	2	3.5	5	33	2	5.7
Small-pox	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tonsilitis	84	78	66	3.4	78	80	63	4.0	63	62	40	1.7	85	77	65	2.7	64	68	44	4.2
Whooping-cough	7	58	4	3.7	17	29	5	9.3	17	49	9	2.1	4	75	3	2.0	25	58	15	3.5

* For counties in each division see Exhibit I, page 85. b, c, d, e, See foot-notes with these marks in Table 2, page 99.

† This page includes the Five Divisions of the State from which the fewest Weekly Reports were received.

TABLE 4.—CONTINUED.†

Diseases.	Western Division.*				Bay and Eastern.*				Central Division.*				Southwestern Div.*				S. Central Div.*				Southeastern Div.*			
	Per Cent of Observers Reporting Presence of.[b]	Av. Per Cent of Weeks Reported Present where Present.[c]	Per Cent of Reports Stating Presence of.[d]	Av. Order of Prevalence where Present.[e]	Per Cent of Observers Reporting Presence of.[b]	Av. Per Cent of Weeks Reported Present where Present.[c]	Per Cent of Reports Stating Presence of.[d]	Av. Order of Prevalence where Present.[e]	Per Cent of Observers Reporting Presence of.[b]	Av. Per Cent of Weeks Reported Present where Presen	Per Cent of Reports Stating Presence of.[d]	Av. Order of Prevalence where Present.[e]	Per Cent of Observers Reporting Presence of.[b]	Av. Per Cent of Weeks Reported Present where Present.[c]	Per Cent of Reports Stating Presence of.[d]	Av. Order of Prevalence where Present.[e]	Per Cent of Observers Reporting Presence of.[b]	Av. Per Cent of Weeks Reported Present where Present.[c]	Per Cent of Reports Stating Presence of.[d]	Av. Order of Prevalence where Present.[e]	Per Cent of Observers Reporting Presence of.[b]	Av. Per Cent of Weeks Reported Present where Present.[c]	Per Cent of Reports Stating Presence of.[d]	Av. Order of Prevalence where Present.[e]
Average for Tabulated Diseases Reported Present	42	66	28	3.9	38	67	26	3.7	39	67	26	3.5	36	67	24	3.3	40	69	28	3.5	40	69	28	4.7
Brain, Inflammation of	14	44	6	4.7	11	36	4	8.3	13	35	5	4.7	11	42	5	4.5	13	43	6	5.6	27	56	15	8.7
Bowels, Inflammation of	38	43	16	4.9	35	59	22	5.1	35	48	18	4.6	21	42	9	4.4	30	52	15	4.6	42	52	22	6.5
Bronchitis	72	79	56	3.7	69	79	55	3.0	74	77	57	3.5	52	79	40	3.2	69	80	56	2.8	77	81	61	2.4
Cerebro-spinal Meningitis	3	25	1	5.0	8	33	2	6.7	16	51	8	5.1	4	32	1	6.6	3	35	1	6.1	10	72	8	17.8
Cholera Infantum	17	49	9	4.8	24	63	15	4.2	20	49	10	4.2	30	51	16	3.8	24	58	14	3.7	25	55	14	5.2
Cholera Morbus	32	55	18	4.6	34	57	20	3.6	29	56	16	4.1	33	51	18	3.4	36	61	22	3.4	31	59	18	5.1
Consumption, Pulmonary	47	83	39	4.6	59	82	48	3.2	61	84	52	4.0	57	87	49	3.7	66	85	57	3.9	77	89	70	2.7
Croup, Membranous	20	47	9	6.2	12	36	4	6.1	12	33	4	4.6	6	39	2	4.9	8	34	3	6.3	13	72	9	12.4
Diphtheria	16	52	9	6.3	18	50	9	3.9	12	43	5	5.8	9	43	4	2.8	23	54	13	4.7	32	64	21	3.9
Diarrhea	66	72	48	3.3	61	14	47	3.0	65	68	45	3.2	57	71	41	2.8	66	74	49	2.8	67	71	48	3.4
Dysentery	27	50	14	4.4	29	60	18	4.7	29	51	14	3.6	31	65	20	3.6	35	61	21	3.8	44	57	25	5.8
Erysipelas	59	48	29	5.1	42	53	23	4.7	47	50	25	4.3	37	52	20	4.3	41	54	22	4.6	50	63	32	5.8
Fever, Intermittent	80	78	64	2.7	67	73	49	2.8	75	78	60	2.4	68	69	47	2.7	65	77	49	3.0	59	63	39	3.4
Fever, Remittent	49	71	36	3.7	40	69	29	3.6	50	70	36	3.1	42	71	30	3.7	63	70	45	3.6	42	67	29	3.2
Fever, Typhoid (Enteric)	13	51	7	5.3	15	57	8	3.8	17	66	12	3.8	10	35	4	4.1	9	59	6	3.8	27	69	19	6.4
Fever, Typho-malarial	32	63	19	4.8	38	60	23	4.4	30	58	18	3.8	29	63	18	3.5	22	61	14	4.5	21	55	11	2.9
Influenza	53	67	36	2.9	49	70	35	3.4	51	68	36	2.6	49	75	37	2.9	57	71	41	2.6	35	76	26	5.2
Kidney, Inflammation of	33	37	12	4.4	28	62	18	5.0	36	58	22	4.1	25	51	13	4.5	35	59	21	4.8	38	57	22	7.1
Measles	40	67	28	2.6	25	59	15	3.0	13	55	7	2.1	26	63	17	3.0	21	57	12	3.5	23	68	15	7.0
Neuralgia	97	87	84	3.2	79	80	64	2.7	90	83	75	2.5	79	81	64	2.8	90	84	77	2.6	76	77	59	3.1
Pneumonia	54	52	29	4.4	47	57	27	4.3	47	62	30	4.0	41	64	26	3.6	45	65	29	3.9	44	59	26	5.1
Puerperal Fever	14	29	4	5.0	11	32	4	4.7	20	38	8	4.5	18	30	6	4.2	6	35	2	4.3	15	65	10	13.8
Rheumatism	80	86	69	3.8	81	79	65	3.2	79	85	67	3.0	81	89	73	2.7	92	85	79	3.1	81	87	71	3.3
Scarlatina	20	48	9	3.8	12	47	6	4.7	7	39	3	3.5	20	43	8	3.2	20	57	11	5.4	18	74	13	7.6
Small-pox	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	25	0.2	26.0
Tonsilitis	78	68	54	4.0	58	69	39	3.6	55	65	36	3.8	66	64	42	3.2	76	67	51	3.3	74	68	51	2.8
Whooping-cough	34	60	20	3.5	26	60	16	5.1	24	55	13	3.5	30	60	18	3.2	21	58	12	3.3	26	65	18	6.7

* For counties in each division see Exhibit I, page 85. [b], [c], [d], [e], See foot-notes with these marks in Table 2, page 99.

† This page includes the Six Divisions of the State from which the most Weekly Reports were Received.

WHAT DISEASES CAUSE MOST SICKNESS.

This is shown in Exhibit VI., in this Report, and in similar exhibits in previous Reports. The question is differently answered in different years. For many years after the compilation of weekly reports was begun, intermittent fever appeared to be the leading cause of sickness in Michigan. In 1884 neuralgia headed the list, with rheumatism second and intermittent fever third. In 1885 neuralgia again headed the list, with intermittent fever second, and rheumatism third. In 1886 rheumatism headed the list, with neuralgia second, bronchitis third, and intermittent fever fourth. In 1887 rheumatism, neuralgia, bronchitis, and consumption of the lungs head the list, in the order named.

Nearly the same diseases appear above the average line each year. Pneumonia has appeared in this exhibit tenth in order for eight years in succession. Some of the diseases of minor importance vary considerably in their order. Whooping-cough, for example, in 1881 and 1883 was nineteenth in order, and rose to twelfth in order in 1886, and dropped to twentieth in 1887.

Exhibit VII. supplies data relative to what diseases caused most sickness in 1887 in each of several geographical divisions of Michigan. It may be seen that there is evidence that there are very great differences in the different parts of the State. Further evidence is very desirable, however, in order to reach conclusions on this important subject. The exhibit will be found of great interest to those who study it carefully, and in connection with previous reports.

EXHIBIT VI.—*Diseases from which there seems to have been the Most Sickness in Michigan in 1887, as indicated by the Per Cent of Weekly Reports Stating Presence of the Diseases, as studied in connection with the Average Order of Prevalence of said Diseases when Reported Present; also Order, Per Cent of Reports, and Average Order for the same Diseases in 1886, 1885, 1884, and 1883.*

	1887.				1886.			1885.			1884.			1883		
	Order.*	Diseases in Order of Apparent Sickness in 1887, Most Prevalent one First.	Per Cent of Reports Stating Pres'ce of, *d*	Av. Order of Prevalence when Pres, *e*	Order.*	Per Cent of Reports Stating Pres'ce of, *d*	Av. Order of Prevalence when Present, *e*	Order.*	Per Cent of Reports Stating Pres'ce of, *d*	Av. Order of Prevalence when Present, *e*	Order.*	Per Cent of Reports Stating Pres'ce of, *d*	Av. Order of Prevalence when Present, *e*	Order.*	Per Cent of Reports Stating Pres'ce of, *d*	Av. Order of Prevalence when Present, *e*
More Sickness than Average for 27 Diseases, in 1887.	1	Rheumatism	69	3 2	1	70	3.2	3	68	3.2	2	70	3.6	4	68	3.7
	2	Neuralgia	67	2.8	2	67	2.8	1	68	2.8	1	70	3.3	2	69	3.3
	3	Bronchitis	55	3.0	3	56	3.0	4	56	3.1	4	61	3.2	3	66	3.2
	4	Consumption, Pul.	51	3.7	4	55	3.9	5	58	4.0	5	63	4.3	5	61	4.5
	5	Intermittent Fever	48	2.8	5	54	2.6	2	59	2.4	3	65	2.5	1	69	2.3
	6	Diarrhea	48	3.0	6	45	3.2	7	46	3.3	6	52	3.3	6	49	3.7
	7	Tonsilitis	47	3.4	7	49	3.4	6	50	3.5	7	50	3.7	7	50	3.9
	8	Influenza	33	3.0	8	35	2.7	8	34	2.9	9	41	3.3	8	43	3.2
	9	Remittent Fever	32	3.4	9	34	3.3	9	36	3.2	8	44	3.3	9	41	3.3
	10	Pneumonia	28	4.3	10	27	4.0	10	27	4.4	10	29	4.5	10	38	4.7
	(11)	Av. for 27 Diseases......†	25	3.7	(10)	26	3.7	(10)	26	3.8	(10)	29	4.2	(11)	30	4.2
Less than said Average.	11	Erysipelas	24	4.7	12	23	4.5	11	24	4.6	12	26	5.2	12	25	5.5
	12	Cholera Morbus	19	3.8	13	17	4.2	15	17	4.5	15	22	4.9	15	18	5.0
	13	Dysentery	19	4.3	14	17	4.5	19	15	5.0	14	23	5.0	13	21	5.2
	14	Inflammation of Kidney	18	4.9	16	20	4.7	12	21	4.4	11	26	5.0	....	....	....
	15	Typho-mal. Fever	16	4.1	15	16	4.2	16	16	4.4	17	20	4.6	14	18	4.8

---

* Judging from the per cent of reports which stated presence of the diseases, in connection with the order of prevalence when prevalent.

† For 1883, the average is for 26 diseases.

d This column states what per cent the number of reports stating presence of a disease is of the whole number of reports received for the time specified, from *all observers* in the State. It combines and states in a general way, an idea of the *time* a disease was prevalent, with an idea of the area of its prevalence.

e The disease having the greatest number of cases was to be marked 1, in the order; the disease having the next greatest number of cases, 2; and so on. Diseases not present were to be marked 0. The numbers in this column are found by dividing the totals of the Order of Prevalence columns, in Table 3 (omitted in this Report), by the number of men who reported the disease present. The column is, therefore, an average not for all the localities represented, but only for those at which the given disease was reported present. The numbers in the "Average" lines for this column are found by dividing the sum of the totals in the Order of Prevalence columns, in Table 3, for all diseases reported present, by the sum of the numbers of men who reported the different diseases present, thus counting each man once for every disease he reported present. As a rule, small numbers in this column indicate the large prevalence of the disease, and *vice versa;* but the greater the number of diseases reported present by each observer, from week to week, the greater will be the "average" in this column.

EXHIBIT VII.—*In each of eleven Geographical Divisions* of the State, the fifteen Diseases from which there seems to have been the Greatest Amount of Sickness in 1887, as indicated by the Per Cent of Weekly Reports Stating Presence of each of 27 Leading Diseases, when studied in connection with the Average Order of Prevalence of said diseases when reported present.*

	Order.†	Diseases in Order of Apparent Amount of Sickness. Most of Prevalent Disease First.	Per Cent of Reports Stating Pres'nce of.[d]	Av. Order of Prevalence when Pres.[e]	Diseases in Order of Apparent Amount of Sickness. Most Prevalent Disease First.	Per Cent of Reports Stating Pres'nce of.[d]	Av. Order of Prevalence when Pres.[e]	Diseases in Order of Apparent Amount of Sickness. Most Prevalent Disease First.	Per Cent of Reports Stating Pres'nce of.[d]	Av. Order of Prevalence when Pres.[e]
		UPPER PENINSULAR DIV.*			NORTHWESTERN DIV.*			WESTERN DIVISION.*		
More Sickness than Average for 27 Diseases.	1	Bronchitis	88	2.4	Intermittent Fever	56	2.2	Neuralgia	84	3.2
	2	Diarrhea	84	2.5	Tonsilitis	63	4.0	Intermittent Fever	64	2.7
	3	Rheumatism	73	3.7	Remittent Fever	53	3.1	Rheumatism	69	3.8
	4	Tonsilitis	66	3.4	Neuralgia	63	4.5	Bronchitis	56	3.7
	5	Typho' Fev.(ent'ric)	44	2.8	Bronchitis	57	3.7	Diarrhea	48	3.3
	6	Neuralgia	61	3.9	Pneumonia	64	4.7	Influenza	36	2.9
	7	Consumption, Pul.	53	3.9	Rheumatism	64	5.0	Measles	28	2.6
	8	Measles	32	3.2	Influenza	53	4.1	Tonsilitis	54	4.0
	9	Cholera Morbus	37	3.7	Dysentery	33	4.8	Remittent Fever	36	3.7
	10	Influenza	11	2.8	Diarrhea	40	5.8	Whooping-cough	20	3.5
					Cerebro-spinal Men.	1	1.0	Average	28	3.9
	(11)	Average	30	3.7	Average	31	5.1	Consumption, Pul.	39	4.6
Less	11	Inflam. of Kidney	27	4.3	Cholera Infantum	24	4.4	Pneumonia	29	4.4
	12	Diphtheria	15	4.0	Erysipelas	29	5.7	Scarlet Fever	9	3.8
	13	Dysentery	13	4.0	Consumption, Pul.	53	9.6	Dysentery	14	4.4
	14	Whooping-cough	4	3.7	Typho-malarial Fev.	22	5.2	Erysipelas	29	5.1
	15	Cholera Infantum	6	3.9	Inflam. of Brain	10	4.0	Cholera Morbus	18	4.6
		NORTHERN DIVISION.*			NORTHEASTERN DIVISION.*					
More Sickness than Av. for 27 Diseases.	1	Tonsilitis	40	1.7	Bronchitis				70	2.4
	2	Intermittent Fever	36	1.8	Neuralgia				75	2.9
	3	Rheumatism	38	2.0	Diarrhea				70	2.7
	4	Neuralgia	30	2.0	Rheumatism				69	2.8
	5	Diarrhea	28	1.9	Tonsilitis				65	2.7
	6	Bronchitis	26	2.3	Influenza				39	1.6
	7	Cholera Morbus	14	2.1	Intermittent Fever				33	2.6
	8	Consumption, Pul.	22	2.6	Consumption, Pulmonary				48	4.0
	(9)	Average	14	2.2	Average				25	3.3
Less	9	Typho-mal. Fever	2	1.5	Diphtheria				2	1.7
	10	Remittent Fever	13	2.3	Cholera Infantum				11	2.5
	11	Influenza	16	2.5	Whooping-cough				3	2.0
	12	Whooping-cough	9	2.1	Erysipelas				26	3.8
	13	Scarlet Fever	2	1.7	Inflammation of Kidney				22	3.9
	14	Measles	2	1.7	Dysentery				26	4.5
	15	Cholera Infantum	12	2.4	Pneumonia				27	4.7

---

* For counties in each division see Exhibit I, page 85.

† Judging from the per cent of reports in connection with the "average order of prevalence where present." d, e. Foot-notes with these marks are on page 99.

EXHIBIT VII.—CONTINUED.

	Order.*	Diseases in Order of Apparent Amount of Sickness. Most Prevalent Disease First.	Per Cent of Reports Stating Presence of.d	Av. Order of Prevalence when Pres.e	Diseases in Order of Apparent Amount of Sickness. Most Prevalent Disease First.	Per Cent of Reports Stating Presence of.d	Av. Order of Prevalence when Pres.e	Diseases in Order of Apparent Amount of Sickness. Most Prevalent Disease First.	Per Cent of Reports Stating Presence of.d	Av. Order of Prevalence when Pres.e
		NORTHERN CEN. DIV.*			BAY AND EAST'N DIV.*			CENTRAL DIV.*		
More Sickness than Av. for 27 Diseases.	1	Intermittent Fev.	59	2.5	Neuralgia	64	2.7	Neuralgia	75	2.5
	2	Rheumatism	59	3.2	Rheumatism	65	3.2	Intermittent Fever.	60	2.4
	3	Diarrhea	44	2.4	Bronchitis	79	5.5	Rheumatism	67	3.0
	4	Remittent Fever	45	2.9	Intermittent Fev.	49	2.8	Bronchitis	57	3.5
	5	Neuralgia	47	3.3	Diarrhea	47	3.0	Influenza	36	2.6
	6	Bronchitis	43	3.1	Consumption, Pul.	48	3.2	Diarrhea	45	3.2
	7	Tonsilitis	44	4.2	Tonsilitis	39	3.6	Remittent Fever	36	3.1
	8	Influenza	11	2.2	Influenza	35	3.4	Consumption, Pul.	52	4.0
	9	Cholera Morbus	22	3.2	Remittent Fever	29	3.6	Measles	7	2.1
	10							Tonsilitis	36	3.8
	(10)	Average	21	3.5	Average	26	3.7			
	(11)							Average	26	3.5
Less	10	Dysentery	17	3.4	Measles	15	3.0	Pneumonia	30	4.0
	11	Typho-mal. Fever.	19	3.7	Cholera Morbus	20	3.6	Whooping-cough	13	3.5
	12	Whooping-cough	15	3.5	Pneumonia	27	4.3	Typho-mal. Fever	18	3.8
	13	Cholera Infantum	16	3.9	Typho-mal. Fever	23	4.4	Dysentery	14	3.6
	14	Consumption, Pul.	32	4.9	Erysipelas	23	4.7	Inflam. of Kidney	22	4.1
	15	Pneumonia	22	4.4	Cholera Infantum	15	4.2	Erysipelas	25	4.3
		SOUTHWESTERN DIV.*			SOUTHERN-CEN. DIV.*			SOUTHEASTERN DIV.*		
More Sickness than Av. for 27 Diseases.	1	Rheumatism	73	2.7	Neuralgia	77	2.6	Consumption, Pul.	70	2.7
	2	Neuralgia	64	2.8	Rheumatism	79	3.1	Rheumatism	71	3.3
	3	Intermittent Fever	47	2.7	Bronchitis	56	2.8	Bronchitis	61	2.4
	4	Diarrhea	41	2.8	Diarrhea	49	2.8	Neuralgia	59	3.1
	5	Influenza	37	2.9	Influenza	41	2.6	Tonsilitis	51	2.8
	6	Tonsilitis	42	3.2	Intermittent Fev.	49	3.0	Diarrhea	48	3.4
	7	Bronchitis	40	3.2	Tonsilitis	51	3.3	Intermittent Fever.	39	3.4
	8	Consumption, Pul.	49	3.7	Consumption, Pul.	57	3.9	Remittent Fever	29	3.2
	9	Remittent Fever	30	3.7	Remittent Fever	45	3.6	Erysipelas	32	5.8
	(10)	Average	24	3.3	Average	28	3.5	Average	28	4.7
Less	10	Measles	17	3.0	Cholera Morbus	22	3.4	Pneumonia	26	5.1
	11	Pneumonia	26	3.6	Pneumonia	29	3.9	Influenza	26	5.2
	12	Whooping-cough	18	3.2	Whooping-cough	12	3.3	Diphtheria	21	3 9
	13	Cholera Morbus	18	3.4	Measles	12	3.5	Dysentery	25	5.8
	14	Dysentery	20	3.6	Dysentery	21	3.8	Cholera Morbus	18	5.1
	15	Typho-mal. Fever.	18	3.5	Cholera Infantum	14	3.7	Inflam. of Bowels	22	6.5

---

* For counties in each division see Exhibit I., page 85.

† Judging from the per cent of reports in connection with the "average order of prevalence where present. d, e. See foot-notes with these marks on page 99.

EXHIBIT VIII.—*Names of Stations where were made the Observations of Meteorological Conditions used in Exhibit X., and following exhibits, relative to Sickness and Meteorological Conditions in 1887; also the Temperature, Humidity, Cloudiness, Ozone, Velocity of Wind, and Atmospheric Pressure, at each Station for which Observations of the given condition are included in the summary statements relative to that condition in said exhibits.*

Stations.* (Those of U. S. Signal Service in Italics.)	Temperature.		Humidity.		Per Cent of Cloudiness.	Ozone.		Wind, Av. Velocity.	Atmospheric Pressure.		
									Range.		
	Av. Daily Range.	Average.	Relative.	Absolute.		Day.	Night.		Monthly.	Av. Daily.	Average.
Number of Stations Included in average	17	17	16	16	17	11	11	9	16	16	16
Average	17.96	44.82	77	3.29	56	3.20	3.42	9.6	1.725	.216	29.203
Marquette	16.66	38.97	76	2.75	57	4.52	3.53	8.9	1.095	.227	29.268
Gulliver Lake	21.63	40.03	83	3.04	50	......	......	......	......	......	......
Escanaba	16.20	38.98	77	2.85	53	2.09	2.07	8.3	1.082	.222	29.341
Traverse City	22.13	43.83	82	3.40	59	3.84	3.90	......	1.127	.222	29.332
Mackinaw City	15.86	39.88	74	2.80	56	......	......	10.8	1.137	.251	29.343
Alpena	16.30	40.62	78	2.94	60	3.76	5.48	8.9	1.157	.231	29.345
Harrisville	22.72	......	......	......	58	4.31	5.06	......	1.131	.239	29.331
Grand Haven	15.00	45.72	74	3.21	61	......	......	11.1	1.043	.211	29.334
Port Huron	15.80	45.23	77	3.33	57	......	......	11.1	1.079	.220	29.333
Thornville	16.24	47.55	78	3.62	51	2.55	2.97	......	1.036	.216	28.947
Agricultural College	21.31	46.60	76	3.41	55	......	......	......	1.005	.207	29.092
Lansing, S. B. of H.	20.34	46.69	76	3.47	57	2.89	3.04	9.8	1.012	.204	29.077
Otsego	......	47.69	......	......	......	......	......	......	......	......	......
Ann Arbor	18.12	47.28	78	3.63	56	3.45	3.46	8.7	1.013	.210	29.032
Kalamazoo	16.81	48.02	77	3.55	59	2.12	2.51	......	.964	.190	29.019
Marshall	19.88	49.92	79	3.87	53	2.68	2.63	......	.972	.199	29.036
Birmingham	22.69	46.49	75	3.43	59	3.00	3.00	......	1.011	.213	29.090
Detroit	15.70	48.41	72	3.40	56	......	......	8.8	1.025	.211	29.322

* At the U. S. Signal Service Stations the observations of mean temperature, humidity, cloudiness, and atmospheric pressure were made at 7 A. M., 3 P. M., and 10 P. M., seventy-fifth Meridian time, which is faster than local time, as follows: At Port Huron, 30 m.; at Detroit, 32 m.; at Alpena, 34 m.; at Grand Haven, 45 m.; at Escanaba, 48 m.; at Marquette, 49 m. At the other stations the observations of these conditions were made at 7 A. M., 2 P. M., and 9 P. M., local time. Observations of range of temperature were made with registering thermometers read and set at 10 P. M., at the Signal Service Stations; at 7 A. M. at other stations. For the ozone observations the test-paper was exposed from 7 A. M. to 2 P. M. for the day observations, and from 9 P. M. to 7 A. M. for the night observations. The velocity of wind was recorded by registering anemometers. These subjects are treated by months in 1887, and for previous years, in an article on Meteorological Conditions in Michigan in 1887, on pages 1-77 of this report.

EXHIBIT IX.—*Showing Comparisons between the Averages of certain Meteorological Conditions at Stations in Michigan in 1887, with those in preceding Years. (Abstracted from Exhibit 5, page 17; Exhibit 8, page 23; Exhibit 11, page 27; Exhibit 13, page 32; Exhibit 18, page 42; Exhibit 22, page 52; Exhibits 24 and 25, page 53; Exhibit 29, page 63; Exhibit 28, page 73.)*

Meteorological Conditions.		Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average Temperature	In 1887 higher than Av. for 10 years, 1877-86	......	......	......	......	......	4.60	1.43	2.70	......	......	......	......	.97
	Lower	1.29	3.98	2.05	4.25	2.24	......	......	......	1.73	3.72	6.37	.86	......
Av. Daily Range of Temp.	In 1887 more than Av. for 8 years, 1879-86	.17	1.62	......	0	.11	1.69	.06	1.41	.97	.05	......	.11	......
	Less	......	......	1.17	0	......	......	......	......	......	......	1.19	......	1.68
Absolute Humidity	In 1887 more than Av. for 10 years, 1877-86	......	......	......	......	......	.52	.23	.22	......	......	......	......	.04
	Less	.15	.13	.06	.32	.12	......	......	......	.62	.61	.73	.14	......
Relative Humidity	In 1887 more than Av. for 9 years, 1878-86	2	......	5	2	5	......	3	......	......	0	0	......	4
	Less	......	4	......	......	......	2	......	2	3	0	0	1	......
Rainfall	In 1887 more than Av. for 10 years, 1877-86	7.36	.44	1.86	......	......	......	......	......	......	......	......	......	.16
	Less	......	......	......	1.45	.96	1.06	1.60	1.10	1.72	.45	.93	1.23	......
Velocity of Wind	In 1887 more than Av. for 5 years, 1882-86	.1	.4	.7	......	.7	......	......	......	......	......	2.4	.9	.3
	Less	......	......	......	.3	......	2.1	1.2	.1	.6	.1	......	......	......
Cloudiness	In 1887 more than Av. for 10 years, 1877-86	0	1	10	......	4	......	7	......	2	3	7	......	6
	Less	0	......	......	9	......	10	......	6	......	......	......	4	......
Day Ozone	In 1887 more than Av. for 10 years, 1877-86	......	......	......	.10	.13	.11	.13	.16	.16	.39	.51	.14	.21
	Less	.14	.14	.17	......	......	......	......	......	......	......	......	......	......
Night Ozone	In 1887 more than Av. for 10 years, 1877-86	.19	......	.17	......	......	.03	.24	.37	.53	.62	.40	......	.07
	Less	......	.10	......	.54	.01	......	......	......	......	......	......	.04	......
Atmospheric Pressure	In 1887 greater than Av. for 10 years, 1877-86	.057	......	.120	.107	.028	.080	.097	.075	.091	.118	......	.038	.027
	Less	......	.085	......	......	......	......	......	......	......	......	.017	......	......

CLIMATE AND SICKNESS.*

Exhibit X., page 119, (and similar exhibits in previous reports) is an attempt to learn something of the relations of bronchitis to meteorological conditions, by noting whether each meteorological condition was above or below its average for the year, in months when more or in months when less bronchitis than the average for the year was reported. The months are arranged in order according to the prevalence of bronchitis: those months in which most bronchitis was reported being placed first in the column; those in which more bronchitis than the average was reported are placed above the average line, the others below that line. The meteorological conditions for each month are printed, in the proper columns, in the line for the month. The statements being thus arranged, it is easy to see whether the temperature, the velocity of the wind, or any other condition represented, was above its annual average in months when more than the average amount of bronchitis was reported, or *vice versa.*

That the comparisons may the more readily be held in mind, propositions have been made concerning the relations of bronchitis to meteorological conditions, grouping the conditions into two classes. The letters *a* and *b* in the Exhibit mark exceptions to these propositions. It is not supposed that the propositions are in every case true concerning every disease; but the propositions serve to bring out the evidence of the exhibit on the subject in question. This evidence is appreciated by noting the number and force of the exceptions to the propositions, and also whether the exception is explained by facts shown in other columns. A summary of the evidence is presented in Exhibit XXIV., near the close of this article.

Exhibits and propositions similar to those relative to bronchitis, but relating to other diseases, are given on following pages. The propositions are differently stated for the summer diseases (beginning with the exhibit on diarrhea) and for the winter diseases (beginning with that on bronchitis), but they are not changed to fit the individual diseases under each class.

RELATIONS OF BRONCHITIS TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1.—That in months when **more** than the average per cent of weekly reports stated the presence of bronchitis the average daily range of temperature, the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, the average velocity of the wind, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere were **greater** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of bronchitis these conditions were **less** than the average for the year. In Exhibit X., page 119, the letter *a* marks exceptions to this proposition for the year 1887.

PROPOSITION 2.—That in months when **more** than the average per cent of weekly reports stated the presence of bronchitis, the average daily temperature, and the absolute humidity of the atmosphere were **less** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of bronchitis these conditions were **greater** than the average for the year. In Exhibit X., page 119, the letter *b* marks exceptions to this proposition for months in 1887.

---

* The remarks under this head are applicable, also, by changing the name of the disease to diseases treated in Exhibits XII, XIV, XV, XVI and XVII, on the following pages. The meteorological data are from places indicated in Exhibit VIII, page 114.

PROPOSITION 3.—For those months which are not, as regards the absolute humidity of the atmosphere, exceptions to Proposition 2, it is true also that the quantity of vapor inhaled daily was **less** than the average, and the quantity exhaled daily in excess of that inhaled was **greater** than the average in months when **more** than the average per cent of reports stated presence of bronchitis; and that **more** vapor was inhaled and a **less** excess exhaled daily in months when the per cent of reports stating presence of bronchitis was **less** than the average.

Proposition 3 also holds true in relation to pneumonia, membranous croup, diphtheria, tonsilitis, influenza, scarlet fever, rheumatism, neuralgia, and pulmonary consumption, treated in Exhibits XII, XIV, XV, XVI, and XVII, on following pages.

What per cent of weekly reports received in 1887 stated presence of bronchitis is graphically represented by months in Diagram 1, page 87.

The evidence of Exhibit X confirms that of similar exhibits relating to bronchitis in previous years.

What per cent of the reports received stated presence of bronchitis by months in each of the years 1877–87; also the average for 1877–1886, and a comparison of 1887 with that average, are shown in Exhibit XI, page 118.

RELATIONS OF PNEUMONIA AND OTHER "COLD WEATHER" DISEASES TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1.—That in months when **more** than the average per cent of weekly reports stated the presence of pneumonia (or of membranous croup, diphtheria, tonsilitis, influenza, scarlet fever, rheumatism, neuralgia, or pulmonary consumption), the average daily range of temperature, the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, the average velocity of the wind, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere, were **greater** than the average for the year; and in months when **less** than the average per cent of the reports stated the presence of pneumonia (or of the other diseases named), these conditions were **less** than the average for the year. In Exhibits XII–XVII, on page 120 and the following pages, the letter *a* marks exceptions to this proposition for the year 1887.

PROPOSITION 2.—That in months when **more** than the average per cent of weekly reports stated the presence of pneumonia (or of membranous croup, diphtheria, tonsilitis, influenza, scarlet fever, rheumatism, neuralgia, or pulmonary consumption), the average daily temperature and the absolute humidity of the atmosphere were **less** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of pneumonia (or of the other diseases named), these conditions were **greater** than the average for the year. In Exhibits XII–XVII, on page 120 and following pages, the letter *b* marks exceptions to this proposition for the year 1887.

What per cent of the weekly reports received in 1887 stated presence of pneumonia is graphically represented by months in Diagram 1, page 87. What per cent of weekly reports received stated presence of pneumonia, and of the other diseases mentioned in the two preceding propositions by months in the years 1877–87, is stated in Exhibit XIII, page 122, where are also given an average for those years and a comparison of 1887 with that average.

From Exhibit XIII it may be seen that pneumonia was considerably less in 1887 than the average for the ten years, 1877–86, and also less in each month in 1887 than for the corresponding months of the ten years, 1877–1886. The average temperature was slightly lower in 1887 than the average for the ten years 1877-86. It was also lower in each month of 1886 except in May, June, July and December, than the average in corresponding months in the ten years 1877-1886. The absolute humidity was less for the year and for each month of the year, except May, June, July and December than the average for the ten years, 1877-1886. The relative humidity was more for the year and for each month of the year, except in February, March, June and December, than the average for the ten years 1877-1886.

The exact force of this evidence cannot yet be estimated, because of the change in method of reporting mentioned on a preceding page, but it can be held tentatively until the present method has been in operation long enough to settle the question.

EXHIBIT XI.—SICKNESS FROM BRONCHITIS, 1877–86.—*By Year and Months for each of the Ten Years 1877–86 and for 1887, Stating on what per cent of the Weekly Reports received Bronchitis was reported present, and comparing the Per Cents for 1887 with the Averages for corresponding Months in those Years.*

Years, Etc.	Annual Av.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average 10 years, 1877-86	61	77	78	77	71	61	53	43	41	48	54	66	71
1877	55	76	72	72	65	45	31	25	22	37	48	71	77
1878	64	77	75	74	71	65	56	41	45	55	60	73	81
1879	64	83	87	83	78	65	54	40	41	50	59	65	77
1880	64	81	84	82	68	59	57	44	45	46	57	67	72
1881	62	86	86	80	78	62	53	38	37	44	44	66	68
1882	65	73	70	75	74	70	62	51	44	57	59	71	71
1883	66	77	80	82	76	70	62	56	53	53	57	61	69
1884	61	71	71	71	65	59	56	49	47	50	56	69	70
1885	56	73	74	76	73	56	52	44	39	45	51	58	64
1886	56	71	69	71	65	57	45	40	37	41	51	61	65
1887	55	67	69	67	62	57	49	41	38	47	57	57	61
In 1887 **Greater** than Av. 1877–86	.....	....	....	....	....	....	....	....	....	....	3	....	....
In 1887 **Less** than Av. 1877-86	6	10	9	10	9	4	4	2	3	1	....	9	10

EXHIBIT X.—BRONCHITIS.—*Stating for the Year and for each month of the year 1887, what per cent of the weekly reports of Diseases stated presence of Bronchitis, and what were the meteorological conditions observed at Stations in Michigan.*[*]

BRONCHITIS.				Temperature, F.		Humidity of Air.[§] Av. of 3 Daily Observations.		Vapor Inhaled and Exhaled from Air Passages by one Person in 24 Hours. Troy Ounces.			Ozone—Relative Scale of 10°.			Atmospheric Pressure. Inches. Reduced to 32° F.		
Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.		Per Cent of Weekly Reports Stating Presence of.[†]	Av. Order of Prevalence where Present[†][‡]	Average Daily Range, by Registering Thermometers.	Average of 3 Daily Observations.	Relative—Per Cent of Saturation.	Absolute—Grains of Vapor in a Cubic Foot of Air.	Inhaled.[‖]	Exhaled in Excess of that Inhaled.[¶]	Averge Per Cent of Cloudiness.	Day Observations, 7 A. M. to 2 P. M.	Night Observations, 9 P. M. to 7 A. M.	Average Velocity of Wind, Miles per Hour, by Anemometer.	Range. Monthly and for Year.	Range. Average Daily, by 3 Daily Observations.[**]	Average Pressure.
More than Av. Per Cent of Bronchitis.	Feb....	69	2.7	*a*17.06	21.57	85	1.45	.91	10.77	72	3.29	4.21	11.1	1.643	.415	29.279
	Jan....	67	2.6	*a*17.96	16.58	*a*77	1.25	.78	10.90	70	*a*3.19	3.81	11.6	1.292	.342	*a*29.105
	Mar....	67	2.5	*a*18.02	25.55	79	1.49	.93	10.75	*a*51	3.54	3.53	9.9	1.253	.251	29.238
	Apr....	62	2.6	19.52	42.09	*a*74	2.63	1.64	10.04	*a*56	3.34	3.55	10.7	1.216	.226	*a*29.140
	Dec....	61	2.5	*a*11.88	27.57	86	1.77	1.11	10.57	83	3.39	3.62	11.0	1.264	.248	29.206
	May...	57	3.0	22.52	*b*60.68	*a*70	*b*4.43	2.77	8.91	*a*38	*a*3.20	*a*3.34	*a*7.4	*a*.724	*a*.122	*a*29.191
	Oct.....	57	3.2	*a*16.50	44.46	*a*76	2.98	1 86	9.82	63	3.29	*a*3.39	11.5	*a*1.003	.218	*a*29.175
	Nov. ..	56	2.7	*a*14.80	35.18	78	2.16	1.35	10.33	64	*a*3.15	*a*3.31	11.6	1.591	.255	*a*29.200
Average.......		55	3.0	18.46	44.82	77	3.29	2.06	9.62	56	3.20	3.42	9.6	1.056	.216	29.203
Less than Av. Per Cent of Bronchitis.	June...	49	3.1	*a*20.68	66.53	75	5.50	2.44	8.24	49	3.01	3.22	6.9	.775	.117	29.190
	Sept....	47	3.5	*a*19.79	57.95	75	4.37	2.73	8.95	49	3.13	3.16	8.4	.832	.174	*a*29.292
	July...	41	3.9	*a*29 91	73.22	70	6.29	3.93	7.75	36	2.85	2.92	7.8	.543	.111	29.176
	Aug....	38	3.9	*a*20.81	66.41	71	5.22	3.26	8.42	45	3.04	3.02	7.0	.529	.110	*a*29.230

---

a An exception to the proposition that **more** than the average per cent of weekly reports stated presence of bronchitis in months when the meteorological condition named at the head of the column was **greater** than the average for the year; and **less** in months when the same condition was **less** than the average. See proposition 1, relating to bronchitis, page 116.

b An exception to the proposition that **more** than the average per cent of weekly reports stated presence of bronchitis in months when the metereological condition named at the head of the column was **less** than the average for the year; and **less** in months when the same condition was **greater** than the average for the year. See proposition 2, relating to bronchitis, page 116.

[*] How many stations, and what stations, are represented in the statements for each meteorological subject may be seen by referring to Exhibit VIII., page 114, in which the stations are named, and a statement for the year 1887, in relation to each meteorological subject, is given for each station included in the average for that subject. In Exhibit VIII. is also stated what time the tri-daily observations were made at each station. Additional statements relative to meteorological conditions may be found in an article on the Principal Meteorological Conditions in Michigan in 1887, on pages 1-77 of this Report.

[†] Explanations of statements in these columns, and other statements relative to the prevalence, in 1887, of the diseases under consideration, may be found in Tables 2, pp. 98, 99, and 4, page 108, of this Report, and also in Diagrams 1 (p. 87), 2, 3, 4, and 5, on following pages. When the per cent of reports stated for any disease is the same for two months or for any month is the same as the average, the order of months in the first column of these exhibits has been determined by reference to fractional per cents.

[‡] Small numbers in this column indicate great prevalence in the localities where the disease occurred, as compared with other diseases; and large numbers a less prevalence.

[§] Calculated from readings of dry bulb and wet bulb thermometers.

[‖] Calculated for 18 respirations per minute, of 20 cubic inches of air each.

[¶] Assuming the air exhaled to be saturated with vapor at the temperature of 98° F., in which case each cubic foot of air contains 18.69 grains of vapor, and 18 respirations per minute, of 20 cubic inches of air each, make 11.68 Troy ounces of vapor exhaled daily. No correction has been made for expansion of air after it is inhaled.

[**] The daily range from which numbers in this column were computed is the difference between the highest and the lowest of the four observations taken during the 24 hours, namely, at 7 A. M., 2 P. M., 9 P. M. of one day, and 7 A. M. of the following day, or at U. S. Signal Service Stations at 7 A. M., 3 P. M., 10 P. M., and 7 A. M., seventy-fifth meridian time, as stated in the * foot-note on page 114.

EXHIBIT XII.—PNEUMONIA AND MEMBRANOUS CROUP.—*Stating for the Year and for each Month of the Year 1887, what per cent of the Weekly Reports of Diseases Stated Presence of Pneumonia; also, of Membranous Croup, and what were the Meteorological Conditions, observed at Stations in Michigan.**

PNEUMONIA.				Temperature, F.		Humidity of Air.§ Av. of 3 Daily Observations.		Vapor inhaled and Exhaled from Air-Passages by one Person in 24 Hours. Troy Ounces.			Ozone—Relative Scale of 10.°			Atmospheric Pressure, Inches, Reduced to 32° F.		
														Range.		
Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.		Per Cent of Weekly Reports Stating Presence of.†	Average Order of Prevalence Where Present.†‡	Average Daily Range, by Registering Thermometers.	Average of 3 Daily Observations.	Relative—Per Cent of Saturation.	Absolute — Grains of Vapor in a Cubic Foot of Air.	Inhaled.‖	Exhaled in Excess of that Inhaled.¶	Average Per Cent of Cloudiness.	Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.	Average Velocity of Wind, Miles Per Hour, by Anemometer.	Monthly and for Year.	Av. Daily by 3 Daily Observations.**	Average Pressure.
More than Av. Pr. Cent of Pneumonia.	Feb..	51	6.2	a17.06	21.57	85	1.45	.91	10.77	72	3.29	4.21	11.1	1.643	.415	29.279
	Mar..	50	6.2	a18.02	25.55	79	1.49	.93	10.75	a51	3.54	3.53	9.9	1.253	.251	29.328
	Jan..	48	7.4	a17.96	16.58	a77	1.25	.78	10.90	70	a3.19	3.81	11.6	1.292	.342	a29.105
	April	41	5.3	19.52	42.09	a74	2.63	1.64	10.04	a56	3.34	3.55	10.7	1.216	.226	a29.140
	May.	34	5.7	22.52	b60.68	a70	b4.43	2.77	8.91	a38	a3.20	a3.34	a7.4	a.724	a.122	a29.191
	Dec..	31	4.1	a11.88	27.57	86	1.77	1.11	10.57	83	3.39	3.62	11.0	1.264	.248	29.206
Average ...		28	4.3	18.46	44.82	77	3.29	2.06	9.62	56	3.20	3.43	9.6	1.058	.216	29.203
Less than Av. Per Cent of Pneumonia.	Nov..	28	4.3	14.80	b35.18	a78	b2.16	1.35	10.33	a64	3.15	3.31	a11.6	1.591	a.255	29.200
	Oct...	17	4.7	16.50	b44.46	76	b2.98	1.86	9.82	a63	a3.29	3.39	a11.5	1.003	a.218	29.175
	June	16	5.7	a20.68	66.53	75	5.50	2.44	8.24	49	3.01	3.22	6.9	.775	.117	29.190
	Sept.	14	5.2	a19.79	57.95	75	4.37	2.73	8.95	49	3.13	3.16	8.4	.832	.174	a29.292
	July.	10	4.7	a21.91	73.22	70	6.29	3.93	7.75	36	2.85	2.92	7.8	.543	.111	29.176
	Aug..	8	5.0	a20.81	66.41	71	5.22	3.26	8.42	45	3.04	3.02	7.0	.529	.110	a29.220
MEMBRANOUS CROUP.																
More than Av. Per Cent of Mem. Croup.	Jan..	10	6.2	a17.96	16.58	a77	1.25	.78	10.90	70	a3.19	3.81	11.6	1.292	.342	a29.105
	Nov..	8	6.6	a14.80	35.18	78	2.16	1.35	10.33	64	a3.15	a3.31	11.6	1.591	.255	a29.200
	Feb..	6	6.1	a17.06	21.57	85	1.45	.91	10.77	72	3.29	4.21	11.1	1.643	.415	29.279
	Dec..	6	7.2	a11.88	27.57	86	1.77	1.11	10.57	83	3.39	3.62	11.0	1.264	.248	29.206
	April	6	5.9	19.52	42.09	a74	2.63	1.64	10.04	a56	3.34	3.55	10.7	1.216	.226	a29.140
	May.	5	5.8	22.52	b60.68	a70	a4.43	2.77	8.91	a38	a3.20	a3.34	a7.4	a.724	a.122	a29.191
	Mar..	4	6.4	a18.02	25.55	79	1.49	.93	10.75	a51	3.54	3.53	9.9	1.253	.251	29.238
Average ...		4	6.8	18.46	44.82	77	3.29	2.06	9.62	56	3.20	3.42	9.6	1.056	.216	29.203
Less than Av. Per Ct. of Mem. Croup.	Oct...	4	6.9	16.50	b44.46	76	b2.98	1.86	9.82	a63	a3.29	3.39	a11.5	1.003	a.218	29.175
	Sept.	2	8.6	a19.79	57.95	75	4.37	2.73	8.95	49	3.13	3.16	8.4	.832	.174	a29.292
	Aug..	2	8.8	a20.81	66.41	71	5.22	3.26	8.42	45	3.04	3.02	7.0	.529	.110	a29.220
	June	2	7.5	a20.68	66.53	75	5.50	2.44	8.24	49	3.01	3.22	6.9	.775	.117	29.190
	July.	1	17.0	a21.91	73.22	70	6.29	3.93	7.75	36	2.85	2.92	7.8	.543	.111	29.176

*, †, ‡, §, ¶, **. See footnotes with these marks in Exhibit X., page 119.

a. An exception to Proposition 1, relating to Pneumonia and Membranous Croup, on page 117.

b. An exception to Proposition 2, relating to Pneumonia and Membranous Croup, on page 117.

DIAGRAM 2.—WEEKLY REPORTS OF SICKNESS IN MICHIGAN, IN 1887.

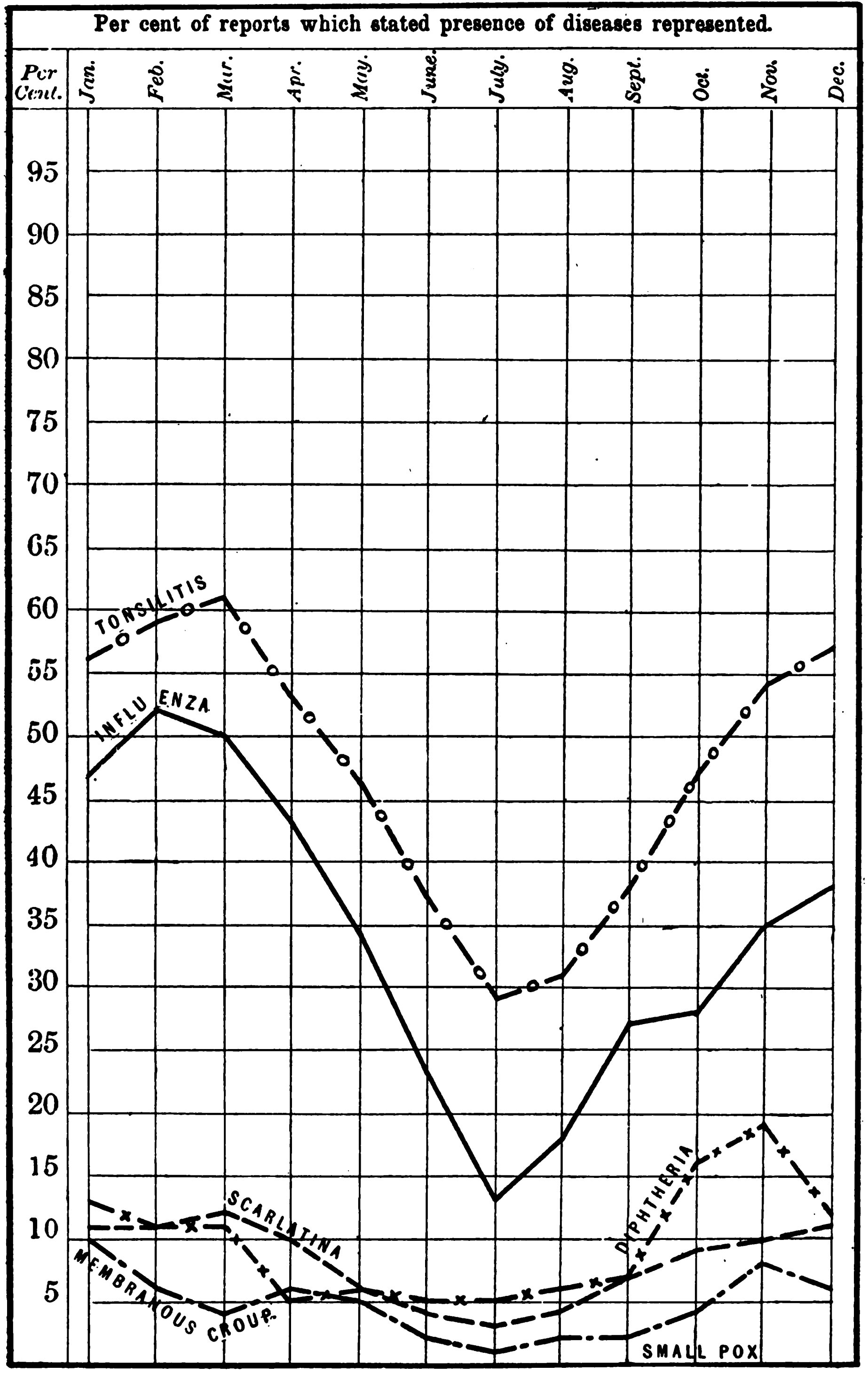


EXHIBIT XIII.—*By Year and Months for 1887, and for the preceding year, and an Average for the Ten Years 1877–86.* Stating on what Per Cent of the Weekly Reports received* PNEUMONIA, MEMBRANOUS CROUP, DIPHTHERIA, RHEUMATISM, INFLUENZA, SCARLET FEVER, TONSILITIS, * AND NEURALGIA* *were Reported Present, and Comparing the Per Cents for Months in 1887, with the Averages for Corresponding Months in those years.*†

	Years, etc.	Year.	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.		Year.	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.
Pneumonia.	Av. 10 years, 1877-86	37	58	63	61	54	39	25	16	13	17	21	33	45	Membranous Croup.	6	12	10	8	7	5	4	2	3	4	6	9	10
	1886	27	37	46	52	41	29	19	11	10	12	13	22	37		5	7	6	4	3	4	4	2	3	5	8	9	8
	1887	28	48	51	50	41	34	16	10	8	14	17	28	31		4	10	6	4	6	5	2	1	2	2	4	8	6
	In 1887 **Greater** than Av. 1877-86	..	..	..	..	..	..	..	..	..	..	..	..	..		..	.	..	..	..	..	..	..	..	..	..	..	..
	In 1887 **Less** than Av. 1877-86.	9	10	12	11	13	5	9	6	5	3	4	5	14		2	2	4	4	3	=	2	1	1	2	2	1	2
Diphtheria.	Av. 10 years, 1877-86	22	28	24	21	20	17	15	15	16	18	26	29	28	Rheumatism.	69	73	73	75	75	71	68	62	57	61	67	72	74
	1886	13	18	14	11	12	12	9	10	10	10	17	18	15		70	68	71	78	76	74	70	63	62	65	69	72	73
	1887	10	13	11	11	5	6	5	5	6	7	16	19	12		69	76	74	77	77	71	70	57	61	66	66	69	70
	In 1887 **Greater** than Av. 1877-86	..	..	..	.	..	..	..	..	..	..	..	..	..		..	3	1	2	2	=	2	..	4	5	..	..	..
	In 1887 **Less** than Av. 1877-86.	12	15	23	10	15	11	10	10	10	11	10	10	14		=	..	..	..	..	..	..	5	..	..	1	3	4
Influenza.	Av. 10 years, 1877-86	40	55	61	59	52	38	28	20	21	29	33	41	48	Scarlatina.	18	22	24	24	22	20	17	14	12	13	16	17	18
	1886	35	44	51	62	54	35	26	14	10	21	27	36	42		11	11	12	17	12	13	13	7	6	7	12	9	13
	1887	33	47	52	50	43	34	23	13	18	27	28	35	38		8	11	11	12	10	6	4	3	4	7	9	10	11
	In 1887 **Greater** than Av. 1877-86	..	..	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..	..
	In 1887 **Less** than Av. 1877-86.	7	8	9	9	9	4	5	7	3	2	5	6	10		10	11	13	12	12	14	13	11	8	6	7	7	7
Tonsilitis.	Av. 8 years, 1879-86	49	60	61	60	53	47	42	33	32	37	45	55	60	Neuralgia.	66	69	71	73	73	67	65	60	58	60	63	68	70
	1886	49	62	63	63	54	44	39	32	31	39	44	52	61		67	69	69	74	74	71	63	63	60	61	63	67	73
	1887	47	56	59	61	53	46	37	29	31	38	47	54	57		67	72	73	76	71	67	66	62	59	65	66	66	65
	In 1887 **Greater** than Av. 1879-86	..	..	..	1	=	..	..	..	..	1	..	..	..		1	3	2	3	..	..	1	2	1	5	3	..	..
	In 1887 **Less** than Av. 1879-86.	2	4	2	..	..	1	5	4	1	..	2	1	3		..	..	..	..	2	=	..	..	..	..	..	2	5

*The average line for tonsilitis and neuralgia includes only the eight years, 1879–86.

† Other statements for 1887, and months in 1887 relative to these diseases are given in Table 2, pages 95–99, and in Exhibits XII., XIV., XV., and XVI., pages 120, 124, 125 and 126, where are also given for convenient comparison statements of coincident meteorological conditions.

The lines for 1887 in Exhibit XIII. are graphically represented in Diagrams 1, page 87, 2, page 121, and 4 on page 123.

DIAGRAM 4—WEEKLY REPORTS OF SICKNESS IN MICHIGAN, IN 1887.

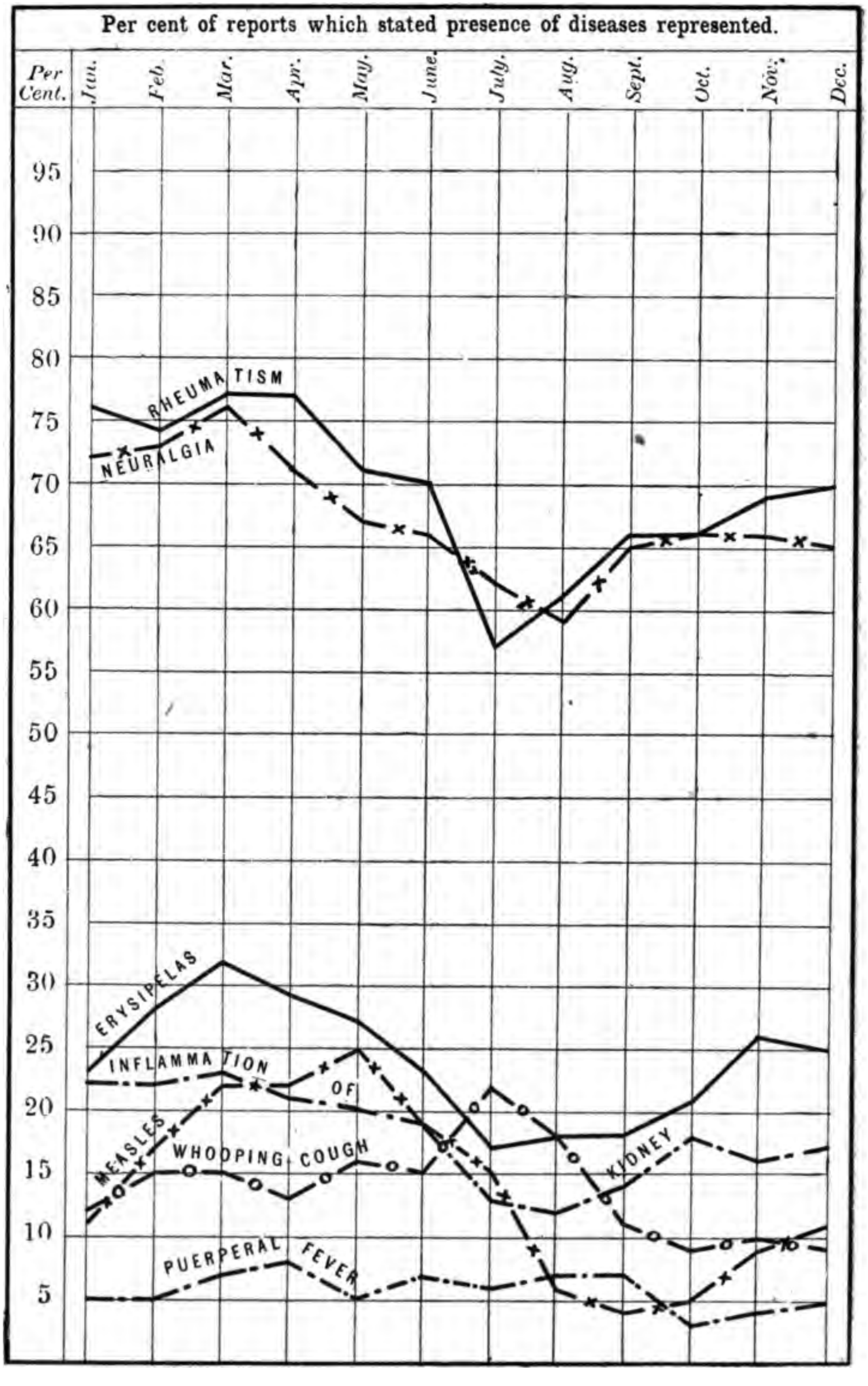


EXHIBIT XIV.—DIPHTHERIA AND TONSILITIS.—*Stating for the Year and for each Month of the Year 1887 what Per cent of the Weekly Reports of Diseases stated Presence of Diphtheria, also of Tonsilitis, and what were the Meteorological Conditions observed at Stations in Michigan.**

DIPHTHERIA.				Temperature, F.		Humidity of Air.§ Av. of 3 Daily Observations.		Vapor Inhaled and Exhaled from Air Passages by one Person in 24 Hours. Troy Ounces.			Ozone—Relative Scale of 10°.			Atmospheric Pressure, Inches. Reduced to 32° F.		
														Range.		
	Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.	Per Cent of Weekly Reports Stating Presence of.†	Average Order of Prevalence Where Present.†‡	Average Daily Range, by Registering Thermometers.	Average of 3 Daily Observations.	Relative Per Cent of Saturation.	Absolute—Grains of Vapor in a Cubic Foot of Air.	Inhaled.‖	Exhaled in Excess of that Inhaled.¶	Average Per Cent of Cloudiness.	Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.	Average Velocity of Wind, Miles Per Hour, by Anemometer.	Monthly and for Year.	Av. Daily, by 3 Daily Observations.**	Average Pressure.
More than Average Per Ct. of Diphtheria.	Nov....	19	3.3	a14.80	35.18	78	2.16	1.35	10.33	64	a3.15	a3.31	11.6	1.591	.255	a29.200
	Oct.....	16	4.2	a16.50	44.46	a76	2.98	1.86	9.82	63	3.29	a3.39	11.5	a1.003	.218	a29.175
	Jan....	13	4.0	a17.96	16.58	a77	1.25	.78	10.90	70	a3.19	3.81	11.6	1.292	.342	a29.105
	Dec....	12	4.3	a11.88	27.57	86	1.77	1.11	10.57	83	3.39	3.62	11.0	1.264	.248	29.206
	Feb....	11	5.2	a17.06	21.57	85	1.45	.91	10.77	72	3.29	4.21	11.1	1.643	.415	29.279
	March	11	5.5	a18.02	25.55	79	1.49	.93	10.75	a51	3.54	3.53	9.9	1.253	.251	29.238
Average......		10	4.4	18.46	44.82	77	3.29	2.06	9.62	56	3.20	3.42	9.6	1.056	.216	29.203
Less than Average Per Ct. of Diphtheria.	Sept...	7	4.8	a19.79	57.95	75	4.37	2.73	8.95	49	3.13	3.16	8.4	.832	.174	a29.292
	May...	6	5.0	a22.52	60.68	70	4.43	2.77	8.91	38	a3.20	3.34	7.4	.724	.122	29.191
	Aug....	6	4.8	a20.81	66.41	71	5.22	3.26	8.42	45	3.04	3.02	7.0	.529	.110	a29.220
	April..	5	4.9	a19.52	b42.09	74	b2.63	1.64	10.04	a56	a3.34	a3.55	a10.7	a1.216	a.226	29.140
	July...	5	4.1	a21.91	73 22	70	6.29	3.93	7.75	36	2.85	2.92	7.8	.543	.111	29.176
	June..	5	3.2	a20.68	66.53	75	5.50	2.44	8.24	49	3.01	3.22	6.9	.775	.117	29.190
TONSILITIS.																
More than Average Per Ct. of Tonsilitis.	March	61	3.4	a18.02	25.55	79	1.49	.93	10.75	a51	3.54	3.53	9.9	1.253	.251	29.238
	Feb....	59	3.3	a17.06	21.57	85	1.45	.91	10.77	72	3.29	4.21	11.1	1.643	.415	29.279
	Dec....	57	2.8	a11.88	27.57	86	1.77	1.11	10.57	83	3.39	3.62	11.0	1.264	.248	29.206
	Jan....	56	3.3	a17.96	16.58	a77	1.25	.78	10.90	70	a3.19	3.81	11.6	1.292	.342	a29.105
	Nov....	54	2.8	a14.80	35.18	78	2.16	1.35	10.33	64	a3.15	a3.31	11.6	1.591	.255	a29.200
	April..	53	3.5	19.52	42.09	a74	2.63	1.64	10.04	a56	3.34	3.55	10.7	1.216	.226	a29.140
	Oct.....	47	3.3	a16.50	44.46	a76	2.98	1.86	9.82	63	3.29	a3.39	11.5	a1.003	.218	a29.175
Average.....		47	3.4	18.46	44.82	77	3.29	2.06	9.62	56	3.20	3.42	9.6	1.056	.216	29.203
Less than Av. Per Ct. of Tonsilitis.	May...	46	3.4	a22 52	60.68	70	4.43	2.77	8.91	38	a3.20	3.34	7.4	.724	.122	29.191
	Sept...	38	3.8	a19.79	57.95	75	4.37	2.73	8.95	49	3.13	3 16	8.4	.832	.174	a29.292
	June...	37	3.3	a20.68	66.53	75	5.50	2.44	8.24	49	3.01	3.22	6.9	.775	.117	29.190
	Aug....	31	4.1	a20.81	66.41	71	5.22	3.26	8.42	45	3.04	3.02	7.0	.529	.110	a29.220
	July...	29	3.8	a21.91	73.22	70	6.29	3.93	7.75	36	2.85	2.92	7.8	.543	.111	29.176

*, †, ‡, §, ‖, ¶, **. See foot-notes with these marks in Exhibit X, page 119.

a. An exception to Proposition 1, relating to Diphtheria and Tonsilitis on page 117.

b. An exception to Proposition 2, relating to Diphtheria and Tonsilitis, on page 117.

EXHIBIT XV.—INFLUENZA AND SCARLET FEVER.—*Stating for the Year and for each Month of the Year 1887, What Per Cent of the Weekly Reports of Diseases stated Presence of Influenza, also, of Scarlet Fever and what were the Meteorological Conditions observed at Stations in Michigan.**

	INFLUENZA.			Temperature. F.		Humidity of Air.§ Av. of 3 Daily Observations.		Vapor Inhaled and exhaled from Air Passages by one Person in 24 Hours.—Troy Ounces.		Average Per Cent of Cloudiness.	Ozone,—Relative Scale of 10.°		Av. Velocity of Wind—Miles Per Hour by Anemometer.	Atmospheric Pressure. Inches Reduced to 32° F.		
	Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.	Per Cent of Weekly Reports Stating Presence of.†	Av. Order of Prevalence where Present.†, ‡.	Av. Daily Range by Registering Thermometers.	Average of Three Daily Observations.	Relative,—Per Cent of Saturation.	Absolute,—Grs. of Vapor in a Cubic Foot of Air.	Inhaled ‖	Exhaled in excess of that Inhaled.¶		Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.		Range.		Average Pressure.
														Monthly, and for Year.	Av. Daily, by 3 Daily Observations.	
More than Av. Per Cent of Influenza.	Feb.	52	2.7	a17.06	21.57	85	1.45	.91	10.77	72	3.29	4.21	11.1	1.643	.415	29.279
	March	50	2.4	a18.02	25.55	79	1.49	.93	10.75	a51	3.54	3.53	9.9	1.253	.251	29.238
	Jan.	47	2.4	a17.96	16.58	a77	1.25	.78	10.90	70	a3.19	3.81	11.6	1.292	.342	a29,105
	Apr.	43	2.7	19.52	42.09	a74	2.63	1.64	10.04	a56	3.34	3.55	10.7	1.216	.226	a29.140
	Dec.	38	2.8	a11.88	27.57	86	1.77	1.11	10.57	83	3.39	3.62	11.0	1.264	.248	29.206
	Nov.	35	3.0	a14.80	35.18	78	2.16	1.35	10.33	64	a3.15	a3.31	11.6	1.591	.255	a29.200
	May	34	3.1	22.52	b60.68	a70	b4.43	2.77	8.91	a38	a3.20	a3.34	a7.4	a.724	a.122	a29.191
Average		33	3.0	18.46	44.82	77	3.29	2.06	9.62	56	3.20	3.42	9.6	1.056	.216	29.203
Less than Av. Per Cent of Influenza.	Oct.	28	3.5	16.50	b44.46	76	b2.98	1.86	9.82	a63	a3.29	3.39	a11.5	1.003	a.218	29.175
	Sept.	27	3.6	a19.79	57.95	75	4.37	2.73	8.95	49	3.13	3.16	8.4	.832	.174	a29.292
	June	23	3.3	a20.68	66.53	75	5 50	2.44	8.24	49	3.01	3.22	6.9	.775	.117	29.190
	Aug.	18	3.7	a20.81	66.41	71	5.22	3.26	8.42	45	3.04	3.02	7.0	.529	.110	a29.220
	July	13	4.7	a21.91	73 22	70	6.29	3.93	7.75	36	2.85	2.92	7.8	.543	.111	29.176
	SCARLET FEVER.															
More than Av. Per Cent of Scarlet Fever.	March	12	6.3	a18.02	25.55	79	1.49	.93	10.75	a51	3 54	3.53	9.9	1.253	.251	29.238
	Jan.	11	4.8	a17.96	16.58	a77	1.25	.78	10.90	70	a3.19	3.81	11.6	1.292	.342	a29.105
	Feb.	11	3.7	a17.06	21.57	85	1.45	.91	10.77	72	3.29	4.21	11.1	1.643	.415	29.279
	Dec.	11	3.4	a11.88	27.57	86	1.77	1.11	10.57	83	3.39	3.62	11.0	1.264	.248	29.206
	Apr.	10	6.7	19.52	42.09	a74	2.63	1.64	10.04	a56	3.34	3.55	10.7	1.216	.226	a20.140
	Nov.	10	4.2	a14.80	35.18	78	2.16	1.35	10.33	64	a3.15	a3.31	11.6	1.591	.255	a29.200
	Oct.	9	4.8	a16.50	44.46	a76	2.98	1.86	9.82	63	3.29	a3.39	11.5	a1.003	.218	a29.175
Average		8	5.0	18.46	44.82	77	3.29	2.06	9.62	56	3.20	3.42	9.6	1.056	.216	29.203
Less than Av. Per Cent of Scarlet Fev.	Sept.	7	4.7	a19.79	57.95	75	4.37	2.73	8.95	49	3.15	3.16	8.4	.832	.174	a29.292
	May	6	7.3	a22.52	60.68	70	4.43	2.77	8.91	38	a3.20	3.34	7.4	.724	.122	29.191
	Aug.	4	5.3	a20.81	66.41	71	5.22	3.26	8.42	45	3.04	3.02	7.0	.529	.110	a29.220
	June	4	6.3	a20.68	66.53	75	5.50	2.44	8.24	49	3.01	3.22	6.9	.775	.117	29.190
	July	3	6.0	a21.91	73.22	70	6.29	3.93	7.75	36	2.85	2.92	7.8	5.43	.111	29.176

---

*, †, ‡, §, ¶, **. See footnotes with these marks in Exhibit X, page 119.

a. An exception to Proposition 1, relating to Influenza and Scarlet Fever, on page 117.

b. An exception to Proposition 2, relating to Influenza and Scarlet Fever on page 117.

EXHIBIT XVI.—RHEUMATISM AND NEURALGIA.—*Stating for the Year and for each Month of the Year 1887, what Per Cent of the Weekly Reports of Diseases Stated Presence of Rheumatism. also of Neuralgia, and what were the Meteorological Conditions Observed at Stations in Michigan.**

RHEUMATISM.				Temperature. F.		Humidity of Air.§ Av. of 3 Daily Observations.		Vapor Inhaled and exhaled from Air Passages by one Person in 24 Hours. Troy Ounces.		Average Per Cent of Cloudiness.	Ozone—Relative Scale of 10°.		Average Velocity of Wind, Miles Per Hour, by Anemometer.	Atmospheric Pressure. Inches. Reduced to 32° F.*		
														Range.		
Months in Order of Greatest Per Cent of Weekly Reports, Stating Presence of.		Per Cent of Weekly Reports Stating Presence of.†	Av. Order of Prevalence where Present.†‡	Av. Daily Range, by Registering Thermometers.	Av. of three Daily Observations.	Relative—Per Cent of Saturation.	Absolute—Grains of Vapor in a Cubic Foot of Air.	Inhaled ‖	Exhaled in Excess of that Inhaled.¶		Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.		Monthly and for Year.	Av. Daily by 3 Daily Observations.**	Average Pressure.
More than Average Per Cent of Rheumatism.	March.	77	3.2	a18.02	25.55	79	1.49	.93	10.75	a51	3.54	3.53	99	1.253	.251	29.238
	April..	77	3 1	19.52	42.09	a74	2.63	1.64	10.04	a56	3.34	3.55	10.7	1.216	.226	a29.140
	Jan....	76	3.2	a17.96	16.58	a77	1.25	.78	10.90	70	a3.19	3.81	11.6	1.292	.342	a29.105
	Feb....	74	3.4	a17.06	21.57	85	1.45	.91	10.77	72	3.29	4.21	11.1	1.643	.415	29.279
	May....	71	2.9	22.52	b60.68	a70	b4.43	2.77	8.91	a38	a3.20	a3.34	a7.4	a.724	a.122	a29.191
	June..	70	2.8	20.68	b66.53	a75	b5.50	2.44	8.24	a49	a3.01	a3.22	a6.9	a.775	a.117	a29.190
	Dec....	70	2.8	a11.88	27.57	86	1.77	1.11	10.57	83	3.39	3.62	11.0	1.264	.248	29.206
Average		69	3.2	18.46	44.82	77	3.29	2.06	9.62	56	3.20	3.42	9.6	1.056	.216	29.203
Less than Average Per Cent of Rheumatism.	Nov. ..	69	2.9	14.80	b35.18	a78	b2.16	1.35	10.33	a64	3.15	3.31	a11.6	a1.591	a.255	29.200
	Oct. ...	66	3.2	16.50	b44.46	76	b2.98	1.8[illegible]	9.82	a63	a3.29	3.39	a11.5	1.003	a.218	29.175
	Sept. ..	66	3.3	a19.79	57.95	75	4.37	2.73	8.95	49	3.13	3.16	8.4	8.32	.174	a29.292
	Aug. ..	61	3.8	a20.81	66.41	71	5.22	3.26	8.42	45	3.04	3.02	7.0	5.29	.110	a29.220
	July...	57	3.6	a21.91	73.22	70	6.29	3.93	7.75	36	2.85	2.92	7.8	5.43	.111	29.176
NEURALGIA.																
More than Average Per Cent of Neuralgia.	March.	76	2.9	a18.02	25.55	79	1.49	.93	10.75	a51	3.54	3.53	9.9	1.253	.251	29.238
	Feb....	73	3.0	a17.06	21.57	85	1.45	.91	10.77	72	3.29	4.21	11.1	1.643	.415	29.279
	Jan....	72	2.9	a17.96	16.58	a77	1.25	.78	10.90	70	a3.19	3.81	11.6	1.292	.342	a29.105
	April..	71	2.8	19.52	42.09	a74	2.63	1.64	10.04	a56	3.34	3.55	10.7	1.216	.226	a29.140
Average		67	2 8	18.46	44.82	77	3.29	2.06	9.62	56	3.20	3.42	9.6	1.056	.216	29.203
Less than Average Per Cent of Neuralgia.	May...	67	2.6	a22.52	60.68	70	4.43	2.77	8.91	38	a3.20	3.34	7.4	.724	.122	29.191
	June...	66	2.5	a20.68	66.53	75	5.50	2.44	8.24	49	3.01	3.22	6.9	.775	.117	29.190
	Oct. ...	66	2.7	16.50	b44.46	76	b2.98	1.86	9.8[illegible]	a63	a3.29	3.39	a11.5	1.003	a.218	29.175
	Nov....	66	2.6	14.80	b35.18	a78	b2.16	1.35	10.33	a64	3.15	3.31	a11.6	a1.591	a.255	29.200
	Sept. ..	65	2.8	a19.79	57.95	75	4.37	2.73	8.95	49	3.13	3.16	8.4	.832	.174	a29.292
	Dec....	65	2.6	11.88	b27.57	a86	b1.77	1.11	10.57	a83	a3.39	a3.62	a11.0	a1.264	a.248	a29.206
	July..	62	3.3	a21.91	73.22	70	6.29	3.93	7.75	36	2.85	2.92	7.8	.543	.111	29.176
	Aug....	59	3.4	a20.81	66.41	71	5.22	3.26	8.42	45	3.04	3.02	7.0	.529	.110	a29.220

*, †, ‡, §, ¶, **. See footnotes with these marks in Exhibit X, page 119.

a An exception to Proposition 1, relating to Rheumatism and Neuralgia, on page 117.

b An exception to Proposition 2, relating to Rheumatism and Neuralgia, on page 117.

EXHIBIT XVII.—PULMONARY CONSUMPTION.—*Stating for the Year and for each Month of the Year 1887, What Per Cent of the Weekly Reports of Diseases Stated Presence of Pulmonary Consumption, and what were the Meteorological Conditions Observed at Stations in Michigan.**

CONSUMPTION.				Temperature, F.		Humidity of Air.§ Av. of 3 Daily Observations.		Vapor Inhaled and Exhaled from Air-Passages by one Person in 24 Hours. Troy Ounces.			Ozone—Relative Scale of 10.°			Atmospheric Pressure,* Inches. Reduced to 32° F.		
														Range.		
Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.		Per Cent of Weekly Reports Stating Presence of.†	Average Order of Prevalence Where Present.†‡	Average Daily Range, by Registering Thermometers.	Average of 3 Daily Observations.	Relative—Per Cent of Saturation.	Absolute — Grains of Vapor in a Cubic Foot of Air.	Inhaled.‖	Exhaled, in Excess of that Inhaled.¶	Average Per Cent of Cloudiness.	Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.	Average Velocity of Wind, Miles Per Hour, by Anemometer.	Monthly and for Year.	Av. Daily, by 3 Daily Observations.**	Average Pressure.
More than Av. Per Ct. of Consumption.	March.	61	4.0	*a*18.02	25.55	79	1.49	.93	10.75	*a*51	3.54	3.53	9.9	1.253	.251	29.238
	April..	61	3.8	19.52	42.09	*a*74	2.63	1.64	10.04	*a*56	3.34	3.55	10.7	1.216	.226	*a*29.140
	May...	54	3.4	22.52	*b*60.68	*a*70	*b*4.43	2.77	8.91	*a*38	*a*3.20	3.34	*a*7.4	*a*.724	*a*.122	*a*29.191
	Feb....	54	3.9	*a*17.06	21.57	85	1.45	.91	10.77	72	3.29	4.21	11.1	1.643	.415	29.279
	Jan....	53	3.9	*a*17.96	16.58	*a*77	1.25	.78	10.90	70	*a*3.19	3.81	11.6	1.292	.342	*a*29.105
Average......		51	3 7	18.46	44.82	77	3.29	2.06	9.62	56	3.20	3.42	9.6	1.056	.216	29.203
Less than Av. Per Cent of Consumption.	Dec....	50	3.5	11.88	*b*27.57	*a*86	*b*1.77	1.11	10.57	*a*83	*a*3.39	*a*3.62	*a*11.0	*a*1.264	*a*.248	*a*29.206
	Oct....	48	3.6	16.50	*b*44.46	76	*b*2.98	1.86	9.82	*a*63	*a*3.29	3.39	*a*11.5	1.003	*a*.218	29.175
	June..	48	3.3	*a*20.68	66.53	75	5.50	2.44	8.24	49	3.01	3.22	6.9	.775	.117	29.190
	July...	48	4.0	*a*21.91	73.22	70	6.29	3.93	7.75	36	2.85	2.92	7.8	.543	.111	29.176
	Nov....	47	3.3	14.80	*b*35.18	*a*78	*b*2.16	1.35	10.33	*a*64	3.15	3.31	*a*11.6	*a*1.591	*a*.255	29.200
	Aug...	47	4.0	*a*20.81	66.41	71	5.22	3.26	8.42	45	3.04	3.02	7.0	.529	.110	*a*29.220
	Sept....	45	3.7	*a*19.79	57.95	75	4.37	2.73	8.95	49	3.13	3.16	8.4	.832	.174	*a*29.292

*, †, ‡, §, ¶, **. See foot-notes with these marks in Exhibit X., page 119.

a. An exception to Proposition 1, relating to Pulmonary Consumption, on page 117.

b. An exception to Proposition 2, relating to Pulmonary Consumption, on page 117.

EXHIBIT XVIII.—SICKNESS FROM CONSUMPTION.—1877-86.—*By Year and Months for each of the Ten Years 1877-86, Stating on what Per Cent of the Weekly Reports received* CONSUMPTION *was Reported Present, and Comparing the Per Cents for 1887 with the Averages for Corresponding Months in those Years.*

Years, Etc.	Annual Av.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average for 9 years, 1878-86*	65	65	68	69	70	67	65	63	61	62	64	64	63
1877*	52	50	47	47	53	49	50	43	35	38	34	68	65
1878	71	67	72	76	75	72	68	68	65	70	73	73	71
1879	70	71	71	69	77	74	73	69	67	67	69	67	64
1880	68	65	69	70	72	70	69	66	62	66	66	68	70
1881	71	74	76	73	76	69	68	67	67	70	73	74	67
1882	66	66	68	66	66	69	66	67	63	63	65	62	65
1883	61	69	66	66	65	62	61	59	55	57	58	58	60
1884	63	56	61	66	70	67	65	63	63	63	65	61	58
1885	58	60	68	71	69	58	61	56	52	54	55	56	56
1886	55	61	58	60	61	60	55	51	52	48	51	55	54
1887	51	53	54	61	61	54	48	48	47	45	48	47	50
In 1887 **Greater** than Av. 1878-86	......	....	....	....	....	....	....	....	....	....	....	....	....
In 1887 **Less** than Av. 1878-86	14	12	14	18	9	13	17	15	14	17	16	17	13

* As consumption was not printed on the first blanks, nor on all used in 1877, that year is excluded from the average line.

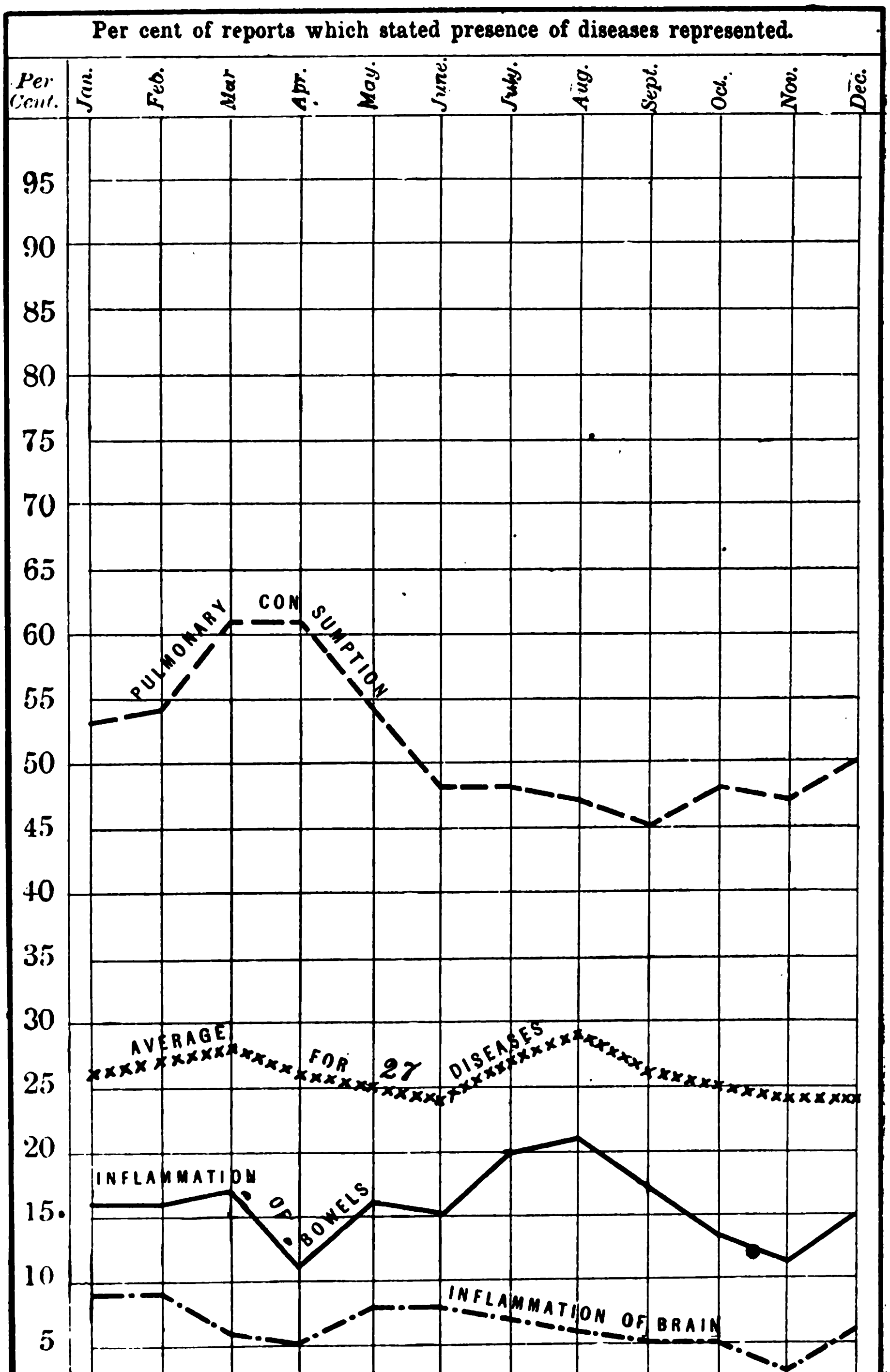
RELATIONS OF DIARRHEA TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1.—That in months when **more** than the average per cent of weekly reports stated the presence of diarrhea, the average daily range of temperature, the average daily temperature, the absolute humidity of the atmosphere, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere were **greater** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of diarrhea, these conditions were **less** than the average for the year. In Exhibit XIX, page 132, the letter *a* marks exceptions to this proposition for the year 1887.

Explanations of propositions 1 and 2 are given on page 116, and a summary of the evidence in Exhibit XIX is given in Exhibit XXV, on a following page.

PROPOSITION 2.—That in months when **more** than the average per cent of weekly reports stated the presence of diarrhea, the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, and the average velocity of the wind were **less** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of diarrhea, these conditions were **greater** than the average for the year. In Exhibit XIX, page 132, the letter *b* marks exceptions to this proposition for 1887.

DIAGRAM 5—WEEKLY REPORTS OF SICKNESS IN MICHIGAN, IN 1887.



PROPOSITION 3.—For those months which are not, as regards the absolute humidity of the atmosphere, exceptions to Proposition 1, it is true also that the quantity of vapor inhaled daily was **greater** than the average, and the quantity exhaled daily in excess of that inhaled was **less** than the average in months when **more** than the average per cent of reports stated presence of diarrhea; and that **less** vapor was inhaled and a **greater** excess exhaled daily in months when the per cent of reports stating presence of diarrhea was **less** than the average.

Proposition 3 is true also in relation to cholera infantum, intermittent fever, remittent fever, typhoid fever, typho-malarial fever, measles and whooping-cough, treated in Exhibits XIX, XXI, XXII, and XXIII, page 132, and following pages.

On what per cent of the weekly reports received, by months in the ten years, 1877–1886, the eight foregoing diseases were reported present is stated in Exhibit XX, page 133. In Diagram 1, page 87, is graphically represented by months what per cent of the reports in each month in 1887 stated the presence of diarrhea.

The greatest sickness reported from diarrhea in 1887, was in the months of August, July, September and June. As shown by Exhibit XX, the reports indicate a slightly increased prevalence of diarrhea in the year 1887. There was a marked increase in June and July, and a marked decrease in September and October. In April and July the per cent was the same as the average for 1877–86.

The average temperature for the year 1887 was slightly lower than the average for 1877–86. It was also lower for each month of the year except in May, June, July, and December, than the average for corresponding months in the ten years, 1877–86. The absolute humidity was less for the year and for each month of the year, except May, June, July, and December, than the average for 1877–86. The relative humidity was more for the year and for each month of the year, except in February, March, June and December, than the average for the ten years, 1877–1886.

RELATIONS OF CHOLERA INFANTUM AND OTHER "WARM WEATHER" DISEASES TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1.—That in months when **more** than the average per cent of weekly reports stated the presence of cholera infantum (or of intermittent fever, remittent fever, typhoid fever, typho-malarial fever, measles, or whooping-cough), the average daily range of temperature, the average daily temperature, the absolute humidity of the atmosphere, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere were **greater** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of cholera infantum (or of the other diseases named), these conditions were **less** than the average for the year. In Exhibit XIX, page 132, the letter *a* marks exceptions to this proposition for the year 1887.

Explanations of propositions 1 and 2 are given on page 116, and a summary of the evidence of Exhibit XIX is given in Exhibit XXV, on a following page.

PROPOSITION 2.—That in months when **more** than the average per cent of weekly reports stated the presence of cholera infantum (or of intermittent fever, remittent fever, typhoid fever, typho-malarial fever, measles, or whooping-cough), the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, and the average velocity of the wind were less than the average for the year; and that in months when less than the average per cent of reports stated the presence of cholera infantum (or of the other diseases named), these conditions were greater than the average for the year. In Exhibit XIX, page 132, the letter *b* marks exceptions to this proposition for 1887.

What per cent of all the weekly reports of sickness in each month in 1887 stated the presence of cholera infantum is graphically represented by months in Diagram 1, page 87. What per cent of the reports received by months in the ten years 1877–86, stated presence of cholera infantum and of the other diseases mentioned in Propositions 1 and 2, is stated in Exhibit XX, page 133.

Cholera infantum was more prevalent during the hot months and immediately following those months,—August, July and September being the months in 1887 in which more than the average sickness from this disease was reported. October usually appears above the average line in Exhibit XIX, but in 1887 it was two per cent below the average.

EXHIBIT XIX.—DIARRHEA AND CHOLERA INFANTUM.—*Stating for the Year and for each Month of the Year 1887, what Per Cent of the Weekly Reports of Diseases Stated Presence of Diarrhea, also, of Cholera Infantum, and what were the Meteorological Conditions observed at Stations in Michigan.**

DIARRHEA.				Temperature, F.		Humidity of Air.§ Av. of 3 Daily Observations.		Vapor inhaled and exhaled from Air-Passages by one Person in 24 Hours. Troy Ounces.		Average Per Cent of Cloudiness.	Ozone—Relative Scale of 10°.		Average Velocity of Wind, Miles Per Hour, by Anemometer.	Atmospheric Pressure, Inches, Reduced to 32° F.		
														Range.		
Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.		Per Cent of Weekly Reports Stating Presence of.†	Average Order of Prevalence Where Present.‡	Average Daily Range by Registering Thermometers.	Average of 3 Daily Observations.	Relative —Per Cent of Saturation.	Absolute—Grains of Vapor in a Cubic Foot of Air.	Inhaled.‖	Exhaled in Excess of that Inhaled.¶		Day Observations, 7 A. M. to 2 P. M.	Night Observations, 9 P. M. to 7 A. M.		Monthly and for Year.	Av. Daily, by 3 Daily Observations.**	Average Pressure.
More than Av. Per Cent of Diarrhea.	Aug..	85	1.6	20.81	66.41	71	5.22	3.26	8.42	45	3.04	3.02	7.0	*a*.529	*a*.110	*a*29.220
	July.	82	1.7	21.91	73.22	70	6.29	3.93	7.75	36	2.85	2.92	7.8	*a*.543	*a*.111	*a*29.176
	Sept.	71	2.4	19.79	57.95	75	4.37	2.73	8.95	49	3.13	3.16	8.4	*a*.832	*a*.174	29.292
	June	52	2.8	20.68	66.53	75	5.50	2.44	8.24	49	3.01	3.22	6.9	*a*.775	*a*.117	*a*29.190
Average......		48	3.0	18.46	44.82	77	3.29	2.06	9.62	56	3.20	3.42	9.6	1.056	.216	29.203
Less than Average Per Cent of Diarrhea.	Oct. .	46	3.0	16.50	44.46	*b*76	2.98	1.86	9.82	63	3.29	*b*3.39	11.5	1.003	*a*.218	29.175
	May.	36	3.7	*a*22.52	*a*60.68	*b*70	*a*4.43	2.77	8.91	*b*38	*b*3.20	*b*3.34	*b*7.4	.724	.122	29.191
	Nov..	34	3.6	14.80	35.18	78	2.16	1.35	10.33	64	*b*3.15	*b*3.31	11.6	*a*1.591	*a*.255	29.200
	Feb..	32	4.1	17.06	21.57	85	1.45	.91	10.77	72	3.29	4.21	11.1	*a*1.643	*a*.415	*a*29.279
	April	32	4.3	*a*19.52	42.09	*b*74	2.63	1.64	10.04	*b*56	3.34	3.55	10.7	*a*1.216	*a*.226	29.140
	Mar..	31	4.6	18.02	25.55	79	1.49	.93	10.75	*b*51	3.54	3.53	9.9	*a*1.253	*a*.251	*a*29.238
	Dec..	30	3.9	11.88	27.57	86	1.77	1.11	10.57	83	3.39	3.62	11.0	*a*1.264	*a*.248	*a*29.206
	Jan..	28	4.2	17.96	16.58	*b*77	1.25	.78	10.90	70	*b*3.19	3.81	11.6	*a*1.292	*a*.342	*a*29.105
CHOLERA INFANTUM.																
More than Av. Pr. Ct. of Cholera Infantum.	Aug..	45	3.5	20.81	66.41	71	5.22	3.26	8.42	45	3.04	3.02	7.0	*a*.529	*a*.110	29.220
	July.	44	3.3	21.91	73.22	70	6.29	3.93	7.75	36	2.85	2.92	7.8	*a*.543	*a*.111	*a*29.176
	Sept.	21	4.2	19.79	57.95	75	4.37	2.73	8.95	49	3.13	3.16	8.4	*a*.832	*a*.174	29.292
Average......		13	4.1	18.46	44.82	77	3.29	2.06	9.62	56	3.20	3.42	9.6	1.056	.216	29.203
Less than Average Per Cent of Cholera Infantum.	June	13	5.0	*a*20 68	*a*66.53	*b*75	*a*5.50	2.44	8.24	*b*49	*b*3.01	*b*3.22	*b*6.9	.775	.117	29.190
	Oct..	6	5.2	16.50	44.46	*b*76	2.98	1.86	9.82	63	3.29	*b*3.39	11.5	1.003	*a*.218	29.175
	May.	5	6.4	*a*22.52	*a*60.68	*b*70	*a*4.43	2.77	8.91	*b*38	*b*3.20	*b*3.34	*b*7.4	.724	.122	29.191
	Feb..	3	4.1	17.06	21.57	85	1.45	.91	10.77	72	3.29	4.21	11.1	*a*1.643	*a*.415	*a*29.279
	Jan..	3	4.1	17.96	16.58	*b*77	1.25	.78	10.90	70	*b*3.19	3.81	11.6	*a*1.292	*a*.342	29.105
	Nov	3	5.3	14.80	35.18	78	2.16	1.35	10.33	64	*b*3.15	*b*3.31	11.6	*a*1.591	*a*.255	29.200
	Mar..	2	5.0	18.02	25.55	79	1.49	.93	10.75	*b*51	3.54	3.53	9.9	*a*1.253	*a*.251	*a*29.238
	Dec..	2	7.0	11.88	27.57	86	1.77	1.11	10.57	83	3.39	3.62	11.0	*a*1.264	*a*.248	*a*29.206
	April	1	4.5	*a*19.52	42.09	*b*74	2.63	1.64	10.04	*b*56	3.34	3.55	10.7	*a*1.216	*a*.226	29.140

*, †, ‡, §, ‖, ¶, **. See foot-notes with these marks in Exhibit X, page 119.

a An exception to Proposition 1, relating to Diarrhea and Cholera Infantum, on page 130.

b An exception to Proposition 2, relating to Diarrhea and Cholera Infantum, on page 130.

EXHIBIT XX.—*By Year and Months for 1887, and for the Preceding Year, and an Average for the Ten Years 1877-86, Stating on what Per Cent of the Weekly Reports Received* DIARRHEA, CHOLERA INFANTUM, INTERMITTENT FEVER, REMITTENT FEVER, TYPHOID FEVER, TYPHO-MALARIAL FEVER MEASLES, *and* WHOOPING-COUGH *were Reported Present, and Comparing the Per Cents for 1887 with the Averages for Corresponding Months in those Years.**

	Years, Etc,	Year.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.		Year.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Diarrhea.	Av. 10 years, 1877-1886	47	27	28	29	32	37	45	73	85	81	56	36	28	Cholera Infantum.	13	2	2	2	2	3	10	31	48	36	14	4	2
	1886	45	27	31	25	31	38	40	66	82	81	51	36	27		14	1	1	2	2	5	10	29	47	42	17	5	2
	1887	48	28	32	31	32	36	52	82	85	71	46	34	30		13	3	3	2	1	5	13	44	45	21	6	3	2
	In 1887 **Greater** than Av. 1877-1886	1	1	4	2	=	..	7	9	=	..	..	..	2		=	1	1	=	..	2	3	13	..	..	..	..	..
	In 1887 **Less** than Av. 1877-86.	..	..	..	..	..	1	..	..	..	10	10	2	..		..	..	..	..	1	..	..	..	3	15	8	1	=
Intermittent Fever.	Av. 10 years, 1877-86	72	58	60	63	72	78	80	82	81	81	79	70	61	Remittent Fever.	48	40	39	41	44	47	48	51	57	60	58	48	42
	1886	54	47	49	50	61	57	61	61	60	58	57	48	41		34	33	29	34	34	35	36	36	36	36	33	34	27
	1887	48	39	42	48	50	52	52	53	55	53	50	42	39		32	29	26	27	30	30	30	31	40	41	42	31	31
	In 1887 **Greater** than Av. 1877-86	..	..	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..	..
	In 1887 **Less** than Av. 1877-86	24	19	18	15	18	26	28	29	26	28	29	28	22		16	11	13	14	14	17	18	20	17	19	16	17	11
Typhoid Fever.	Av. 10 years, 1877-86	12	11	8	7	6	5	6	7	13	20	22	21	15	Typho-malarial Fever.	22	18	15	14	12	12	12	16	25	40	43	33	22
	1886	8	6	3	4	3	5	4	5	13	16	16	13	10		16	10	9	12	9	11	10	14	18	27	25	24	15
	1887	10	6	10	4	3	3	4	8	14	22	18	15	11		16	10	12	10	10	6	7	13	27	33	30	17	9
	In 1887 **Greater** than Av. 1877-86	..	..	2	..	..	..	..	1	1	2	..	..	..		..	..	..	..	..	..	..	..	2	..	..	..	..
	In 1887 **Less** than Av. 1877-86.	2	5	..	3	3	2	2	..	..	..	4	6	4		6	8	3	4	2	6	5	3	..	7	13	16	13
Measles.	Av. 10 years, 1877-86	13	10	13	16	21	26	21	14	7	5	5	6	7	Whooping-cough.	20	20	20	20	17	19	20	22	23	22	19	20	19
	1886	6	4	5	6	5	11	7	4	4	4	4	5	7		20	16	17	17	15	23	23	23	26	24	20	19	14
	1887	14	11	17	22	22	25	19	15	6	4	5	9	11		14	12	15	15	13	16	15	22	18	11	9	10	9
	In 1887, **Greater** than Av. 1877-86	1	1	4	6	1	..	..	1	..	..	..	3	4		..	..	..	..	..	..	..	..	..	..	..	..	..
	In 1887, **Less** than Av. 1877-86	..	..	..	..	..	1	2	..	1	1	=	..	..		6	8	5	5	4	3	5	=	5	11	10	10	10

---

*Other statements for 1887 and months in 1887, relative to these diseases, are given in Table 2, pages 98-99, and in Exhibits XIX, XXI, XXII and XXIII, pages 132, 134, and 137, where are also given for convenient comparison statements of coincident meteorological conditions. The lines for 1887 are graphically represented in Diagrams 1, page 87; 3, page 135; and 4, page 123.

EXHIBIT XXI.—INTERMITTENT FEVER AND REMITTENT FEVER.—*Stating for the Year, and for each Month of the Year 1887, what Per Cent of the Weekly Reports of Diseases Stated Presence of Intermittent Fever, also, of Remittent Fever, and what were the Meterological Conditions observed at Stations in Michigan.**

INTERMITTENT FEVER.				Temperature, F.		Humidity of Air.§ Av. of 3 Daily Observations.		Vapor Inhaled and Exhaled from Air-Passages by one Person in 24 Hours. Troy Ounces.		Average Per Cent of Cloudiness.	Ozone—Relative Scale of 10°.		Average Velocity of Wind, Miles Per Hour, by Anemometer.	Atmospheric Pressure, Inches. Reduced to 32° F.		
														Range.		
Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.		Per Cent of Weekly Reports Stating Presence of.†	Average Order of Prevalence Where Present.‡‡	Average Daily Range, by Registering Thermometers.	Average of 3 Daily Observations.	Relative—Per Cent of Saturation.	Absolute—Grains of Vapor in a Cubic Foot of Air.	Inhaled.‖	Exhaled in Excess of that Inhaled.¶		Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.		Monthly and for Year.	Av. Daily, by 3 Daily Observations.**	Average Pressure.
More than Av. Per Cent of Intermittent Fever.	Aug....	55	2.8	20.81	66.41	71	5.22	3.26	8.42	45	3.04	3.02	7.0	*a* .529	*a* .110	29.220
	July....	53	2.5	21.91	73.22	70	6.29	3.93	7.75	36	2.85	2.92	7.8	*a* .543	*a* .111	*a* 29.176
	Sept....	53	2.7	19.79	57.95	75	4.37	2.73	8 95	49	3.13	3.16	8.4	*a* .832	*a* .174	29.292
	June....	52	2.3	20.68	66.53	75	5.50	2.44	8.24	49	3.01	3.22	6.9	*a* .775	*a* .117	*a* 29.190
	May....	52	2.6	22.52	60.68	70	4.43	2.77	8.91	38	*b* 3.20	3.34	7.4	*a* .724	*a* .122	*a* 29.191
	Oct......	50	2.5	*a*16.50	*a*44.46	76	*a* 2.98	1.86	9.82	*b* 63	*b* 3.29	3.39	*b* 11.5	*a*1.003	.218	*a* 29.175
	April..	50	3.1	19.52	*a*42.09	74	*a* 2.63	1.64	10.04	*b* 56	*b* 3.34	*b* 3.55	*b* 10.7	1.216	.226	*a* 29.140
Average		48	2.8	18.46	44.82	77	3.29	2.06	9.62	56	3.20	3.42	9.6	1.056	.216	29.203
Less than Av. Per Cent of Intermittent Fever.	March	48	3.4	18.02	25.55	79	1.49	.93	10.75	*b* 51	3.54	3.53	9.9	*a*1.253	*a* .251	*a* 29.238
	Feb.	42	3.5	17.06	21.57	85	1.45	.91	10.77	72	3.29	4.21	11.1	*a*1.643	*a* .415	*a* 29.279
	Nov....	42	2.6	14.80	35.18	78	2.16	1.35	10.33	64	*b* 3.15	*b* 3.31	11.6	*a*1.591	*a* .255	29.200
	Dec.	39	2.9	11.88	27.57	86	1.77	1.11	10 57	83	3.39	3.62	11.0	*a*1.264	*a* .248	*a* 29.206
	Jan.	39	3.2	17.96	16.58	*b* 77	1.25	.78	10.90	70	*b* 3.19	3.81	11.6	*a*1.292	*a* .342	29.105
REMITTENT FEVER.																
More than Av. Pr. Ct. of Remittent Fever.	Oct.	42	3.1	*a*16.50	*a*44.46	76	*a* 2.98	1.86	9.82	63	*b* 3.29	3.39	*b* 11.5	*a*1.003	.218	*a* 29.175
	Sept. ...	41	2.9	19.79	57.95	75	4.37	2.73	8.95	49	3.13	3.16	8.4	*a* .832	*a* .174	29.292
	Aug....	40	3.2	20.81	66.41	71	5.22	3.26	8.42	45	3.04	3.02	7.0	*a* .529	*a* .110	29.220
Average		32	3.4	18.46	44.82	77	3.29	2.06	9.62	56	3.20	3.42	9.6	1.056	.216	29.203
Less than Av. Per Cent of Remittent Fever.	Dec....	31	3.1	11.88	27.57	86	1.77	1.11	10.57	83	3.39	3.62	11.0	*a*1.264	*a* .248	*a* 29.206
	Nov....	31	2.8	14.80	35.18	78	2.16	1.35	10.33	64	*b* 3.15	*b* 3.31	11.6	*a*1.591	*a* .255	29.200
	July....	31	3.4	*a*21.91	*a*73.22	*b* 70	*a* 6.29	3.92	7.75	*b* 36	*b* 2.85	*b* 2.92	*b* 7.8	.543	.111	29.176
	June ..	30	3.0	*a*20.68	*a*66.53	*b* 75	*a* 5.50	2.44	8.24	*b* 49	*b* 3.01	*b* 3.22	*b* 6.9	.775	.117	29.190
	May....	30	3.3	*a*22.52	*a*60.68	*b* 70	*a* 4.43	2.77	8.91	*b* 38	*b* 3.20	*b* 3.34	*b* 7.4	.724	.122	29.191
	April..	30	3.6	*a*19.52	42.09	*b* 74	2.63	1.64	10.04	*b* 56	3.34	3.55	10.7	*a*1.216	*a* .226	29.140
	Jan.....	29	4.2	17.96	16.58	*b* 77	1.25	.78	10.90	70	*b* 3.19	3.81	11.6	*a*1.292	*a* .342	29.105
	March.	27	4.1	18.02	25.55	79	1.49	.93	10.75	*b* 51	3.54	3.53	9.9	*a*1.253	*a* .251	*a* 29.238
	Feb.	26	4.3	17.06	21.57	85	1.45	.91	10.77	72	3.29	4.21	11.1	*a*1.643	*a* .415	*a* 29.279

*, †, ‡, §, ¶, **. See foot-notes with these marks in Exhibit X, page 119.

a An exception to Proposition 1, relating to Intermittent Fever and Remittent Fever, on page 130.

b An exception to Proposition 2, relating to Intermittent Fever and Remittent Fever, on page 130.

DIAGRAM 3.—WEEKLY REPORTS OF SICKNESS IN MICHIGAN, IN 1887.

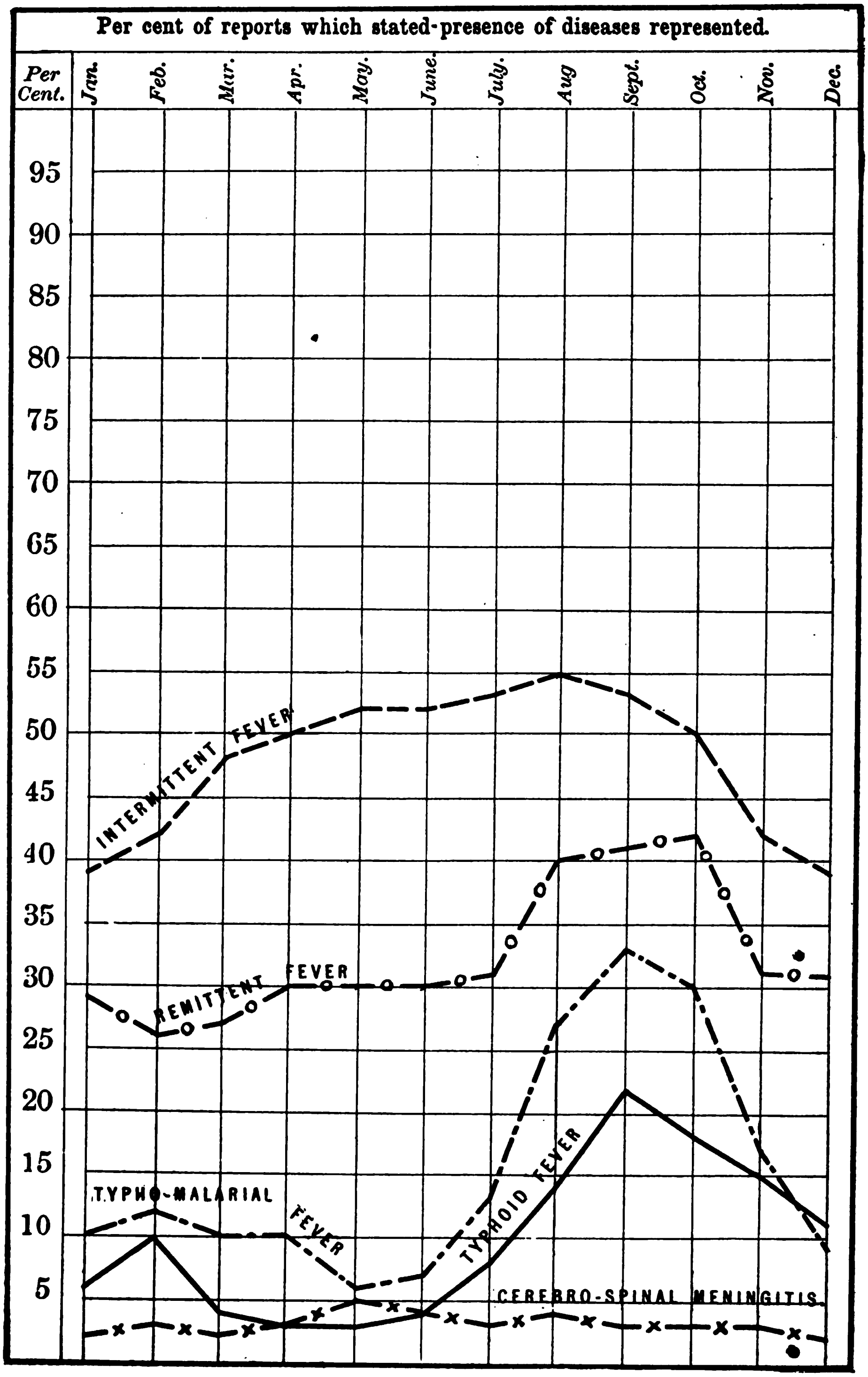


EXHIBIT XXII.—TYPHOID FEVER AND TYPHO-MALARIAL FEVER.—*Stating for the Year and for each Month of the Year 1887, what Per Cent of the Weekly Reports of Diseases stated Presence of Typhoid Fever; also, of Typho-Malarial Fever, and what were the Meteorological Conditions Observed at Stations in Michigan.**

TYPHOID FEVER.				Temperature, F.		Humidity of Air.§ Av. of 3 Daily Observations.		Vapor Inhaled and Exhaled from Air Passages by one Person in 24 Hours. Troy Ounces.		Average Per Cent of Cloudiness.	Ozone—Relative Scale of 10°.		Average Velocity of Wind, Miles per Hour, by Anemometer.	Atmospheric Pressure, Inches. Reduced to 32° F.		
Months in order of greatest Per Cent of Weekly Reports stating presence of.		Per Cent of Weekly Reports Stating Presence of.†	Av. Order of Prevalence where Present.‡‡	Average Daily Range, by Registering Thermometers.	Average of 3 Daily Observations.	Relative Per Cent of Saturation.	Absolute—Grains of Vapor in a Cubic Foot of Air.	Inhaled ‖	Exhaled in Excess of that Inhaled.¶		Day Observation, 7 A. M., to 2 P. M.	Night Observation, 9 P. M., to 7 A. M.		Range.		Average Pressure.
														Monthly and for Year.	Average Daily, by 3 Daily Observations.**	
More than Av. Per Cent of Typhoid Fever.	Sept. ...	22	3.8	19.79	57.95	75	4.37	2.73	8.95	49	3.13	3.16	8.4	a8.32	a.174	29.292
	Oct.	18	3.8	a16.50	a44.46	76	a2.98	1.86	9.82	b63	b3.29	3.39	b11.5	a1.003	.218	a29.175
	Nov....	15	3.7	a14.80	a35.18	b78	a2.16	1.35	10.33	b64	3.15	3.31	b11.6	1.591	.255	a29.200
	Aug....	14	4.6	20.81	66.41	71	5.22	3.26	8.42	45	3.04	3.02	7.0	a.529	a.110	29.220
	Dec. ...	11	4.9	a11.88	a27.57	b86	a1.77	1.11	10.57	b83	b3.39	b3.62	b11.0	1.264	.248	29.206
	Feb. ...	10	5.3	a17.06	a21.57	b85	a1.45	.91	10.77	b72	b3.29	b4.21	b11.1	1.643	.415	29.279
Average......		10	4.5	18.46	44.82	77	3.29	2.06	9.62	56	3.20	3.42	9.6	1.056	.216	29.203
Less than Av. Per Cent of Typhoid Fever.	July...	8	4.5	a21.91	a73.22	b70	a6.29	3.93	7.75	b36	b2.85	b2.92	b7.8	.543	.111	29.176
	Jan. ...	6	4.4	17.96	16.58	b77	1.25	.78	10.90	70	b3.19	3.81	11.6	a1.292	a.342	29.105
	March.	4	6.7	18.02	25.55	79	1.49	.93	10.75	b51	3.54	3.53	9.9	a1.253	a.251	a29.238
	June ..	4	4.6	a20.68	a66.53	b75	a5.50	2.44	8.24	b49	b3.01	b3.22	b6.9	.775	.117	29.190
	May ...	3	7.2	a22.52	a60.68	b70	a4.43	2.77	8.91	b38	b3.20	b3.34	b7.4	.724	.122	29.191
	April..	3	6.8	a19.52	42.09	b74	2.63	1.64	10.04	b56	3.34	3.55	10.7	a1.216	a.226	29.140
TYPHO-MALARIAL FEVER.																
More than Av. Per Cent of Typho-mal. F.	Sept. ..	33	3.5	19.79	57.95	75	4.37	2.73	8.95	49	3.13	3.16	b8.4	a.832	a.174	29.292
	Oct. ...	30	3.4	a16.50	a44.46	76	a2.98	1.86	9.82	63	b3.29	3.39	11.5	a1.003	.218	a29.175
	Aug....	27	4.0	20.81	66.41	71	5.22	3.26	8.42	45	3.04	3.02	b7.0	a.529	a.110	29.220
	Nov....	17	4.0	a14.80	a35.18	b78	a2.16	1.35	10.33	b64	3.15	3.31	11.6	1.591	.255	a29.200
Average		16	4.1	18.46	44.82	77	3.29	2.06	9.62	56	3.20	3.42	9.6	1.056	.216	29.203
Less than Average Per Cent of Typho-malarial Fever.	July...	13	5.6	a21.91	a73.22	b70	a6.29	3.93	7.75	b36	b2.85	b2.92	b7.8	.543	.111	29.176
	Feb. ...	12	4.6	17.06	21.57	85	1.45	.91	10.77	72	3.29	4.21	11.1	a1.643	a.415	a29.279
	Jan. ...	10	4.6	17.96	16.58	b77	1.25	.78	10.90	70	b3.19	3.81	11.6	a1.292	a.342	29.105
	March	10	4.2	18.02	25.55	79	1.49	.93	10.75	b51	3.54	3.53	9.9	a1.253	a.251	a29.238
	April..	10	3.8	a19.52	42.09	b74	2.63	1.64	10.04	b56	3.34	3.55	10.7	a1.216	a.226	29.140
	Dec. ...	9	4.1	11.88	27.57	86	1.77	1.11	10.57	83	3.39	3.62	11.0	a1.264	a.248	a29.206
	June ..	7	4.4	a20.68	a66.53	b75	a5.50	2.44	8.24	b49	b3.01	b3.22	b6.9	.775	.117	29.190
	May...	6	4.7	a22.52	a60.68	b70	a4.43	2.77	8.91	b38	b3.20	b3.34	b7.4	.724	.122	29.191

*, †, ‡, §, ¶, **. See foot-notes with these marks in Exhibit X, page 119.

a. An exception to Proposition 1, relating to Typhoid and Typho-malarial Fever, on page 130.

b. An exception to Proposition 2, relating to Typhoid and Typho-malarial Fever, on page 130.

EXHIBIT XXIII.—MEASLES AND WHOOPING-COUGH.—*Stating for the Year and for each Month of the Year 1887 what Per Cent of the Weekly Reports of Diseases Stated Presence of Measles, also of Whooping-cough; and what were the Meteorological Conditions observed at Stations in Michigan.*[*]

MEASLES.				Temperature, F.		Humidity of Air.[§] Av. of 3 Daily Observations.		Vapor Inhaled and Exhaled from Air Passages by one person in 24 hours. Troy Ounces.			Ozone,—Relative Scale of 10°.			Atmospheric Pressure, Inches. Reduced to 32° F.		
	Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.	Per Cent of Weekly Reports Stating Presence of.[†]	Average Order of Prevalence where Present.[†,‡]	Average Daily Range by Registering Thermometers.	Agverage of three Daily Observations.	Relative—Per Cent of Saturation.	Absolute—Grains of Vapor in a Cubic Foot of Air.	Inhaled.[‖]	Exhaled, in excess of that Inhaled.[¶]	Average Per Cent of Cloudiness.	Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.	Average Velocity of Wind, Miles per hour by Anemometer.	Range. Monthly and for Year.	Range. Average Daily, by three Daily Observations.[**]	Average Pressure.
More than Av. Per Ct. of Measles.	May...	25	2.9	22.52	60.68	70	4.43	2.77	8.91	38	*b*3.20	3.34	7.4	*a*.724	*a*.122	*a*29.191
	March	22	3.5	*a*18.02	*a*25.55	*b*79	*a*1.49	.93	10.75	51	*b*3.54	*b*3.53	*b*9.9	1.253	.251	29.238
	April..	22	3.9	19.52	*a*42.09	74	*a*2.63	1.64	10.04	*b*56	*b*3.34	*b*3.55	*b*10.7	1.216	.226	*a*29.140
	June..	19	2.5	20.68	66.53	75	5.50	2.44	8.24	49	3.01	3.22	6.9	*a*775	*a*.117	*a*29.190
	Feb....	17	3.9	*a*17.06	*a*21.57	*b*85	*a*1.45	.91	10.77	*b*72	*b*3.29	*b*4.21	*b*11.1	1.643	.415	29.279
	July...	15	3.6	21.91	73.22	70	6.29	3.93	7.75	36	2.85	2.92	7.8	*a*.543	*a*.111	*a*29.176
Average......		14	3.6	18.46	44.82	77	3.29	2.06	9.62	56	3.20	3.42	9.6	1.056	.216	29.203
Less than Av. Per Ct. of Measles.	Dec....	11	4.2	11.88	27.57	86	1.77	1.11	10.57	83	3.39	3.62	11.0	*a*1.264	*a*.248	*a*29.206
	Jan....	11	3.3	17.96	16.58	*b*77	1.25	.78	10.90	70	*b*3.19	3.81	11.6	*a*1.292	*a*.342	29.105
	Nov....	9	3.8	14.80	35.18	78	2.16	1.35	10.33	64	*b*3.15	*b*3.31	11.6	*a*1.591	*a*.255	29.200
	Aug...	6	4.9	*a*20.81	*a*66.41	*b*71	*a*5.22	3.26	8.42	*b*45	*b*3.04	*b*3.02	*b*7.0	.529	.110	*a*29.220
	Oct....	5	4.9	16.50	44.46	*b*76	2.98	1.86	9.82	63	3.29	*b*3.39	11.5	1.003	*a*.218	29.175
	Sept...	4	6.0	*a*19.79	*a*57.95	*b*75	*a*4.37	2.73	8.95	*b*49	*b*3.13	*b*3.16	*b*8.4	.832	.174	*a*29.292
WHOOPING-COUGH																
More than Av. Per Ct. of Whooping cough.	July...	22	4.1	21.91	73.22	70	6.29	3.93	7.75	36	2.85	2.92	7.8	*a*.543	*a*.111	*a*29.176
	Aug....	18	4.3	20.81	66.41	71	5.22	3.26	8.42	45	3.04	3.02	7.0	*a*.529	*a*.110	29.220
	May...	16	3.9	22.52	60.68	70	4.43	2.77	8.91	38	*b*3.20	3.34	7.4	*a*.724	*a*.122	*a*29.191
	June...	15	3.3	20.68	66.53	75	5.50	2.44	8.24	49	3.01	3.22	6.9	*a*.775	*a*.117	*a*29.190
	Feb...	15	4.5	*a*17.06	*a*21.57	*b*85	*a*1.45	.91	10.77	*b*72	*b*3.29	*b*4.21	*b*11.1	1.643	.415	29.279
	Mar...	15	4.6	*a*18.02	*a*25.55	*b*79	*a*1.49	.93	10.75	51	*b*3.54	*b*3.53	*b*9.9	1.253	.251	29.238
Average......		14	4.2	18.46	44.82	77	3.29	2.06	9.62	56	3.20	3.42	9.6	1.056	.216	29.203
Less than Av. Per Ct. of Whooping-cough.	April..	13	4.9	*a*19.52	42.09	*b*74	2.63	1.64	10.04	*b*56	3.34	3.55	10.7	*a*1.216	*a*.226	29.140
	Jan....	12	4.5	17.96	16.58	*b*77	1.25	.78	10.90	70	*b*3.19	3.81	11.6	*a*1.292	*a*.342	29.105
	Sept...	11	4.0	*a*19.79	*a*57.95	*b*75	*a*4.37	2.73	8.95	*b*49	*b*3.13	*b*3.16	*b*8.4	.832	.174	*a*29.292
	Nov....	10	4.2	14.80	35.18	78	2.16	1.35	10.33	64	*b*3.15	*b*3.31	11.6	*a*1.591	*a*.255	29.200
	Oct....	9	3.9	16.50	44.46	*b*76	2.98	1.86	9.82	63	3.29	*b*3.39	11.5	1.003	*a*.218	29.175
	Dec....	9	5.1	11.88	27.57	86	1 77	1.11	10.57	83	3.39	3.62	11.0	*a*1.264	*a*.248	*a*29.206

*, †, ‡, §, ¶, **. See footnotes with these marks in Exhibit X, page 119.
a. An exception to Proposition 1, relating to Measles and Whooping-cough, on page 130.
b. An exception to Proposition 2, relating to Measles and Whooping-cough, on page 130.

COLD WEATHER DISEASES.

EXHIBIT XXIV.—*Summary Relative to Propositions contained in Exhibits X., XII., XIV., XV., XVI., etc., (pages 119-126) concerning Relations by Months in 1887 between Greater or Less than usual Prevalence of Diseases named, and certain given coincident Climatic Conditions.*

Diseases.	Months (inclusive) in which Diseases named were More than Usually Prevalent in 1887.	Months (inclusive) in which Diseases named were Less than Usually Prevalent in 1887.	For the 12 Months of the Year 1887. Number of Months in which Propositions Hold True.*										
			That in Months when Diseases named were more than Usually Prevalent the Conditions named below were Greater than Usual, and in Months when less than Usually Prevalent these Conditions were Less than Usual.									That in Months when Diseases named were more than Usually Prevalent the Conditions named below were Lower than Usual, and in Mos. when the Diseases were Less than Usually Prevalent these Conditions were Higher than Usual.	
			For Av. Daily Range of Temp.	Relative Humidity.	Av. Per Cent of Cloudiness.	Ozone.		Velocity of wind.	Atmospheric Pressure.			Av. Temp.	Absolute Humidity.
									Range.				
						Day.	Night.		Monthly.	Av. Daily.	Average Daily.		
Bronchitis	Jan. to May, Oct. to Nov.	June to Aug.	2	7	9	9	9	11	10	11	5	11	11
Pneumonia	Jan. to May, Dec.	June to Nov.	4	8	7	9	11	9	10	10	7	9	9
Memb. Croup	Jan. to May, Nov. to Dec.	June to Oct.	3	9	8	10	10	10	11	10	6	10	10
Diphtheria	Jan. to Mar., Oct. to Dec.	Apr. to Sept.	0	10	10	8	9	11	10	11	7	11	11
Tonsilitis	Jan. to Apr., Oct. to Dec.	May to Sept.	1	9	10	9	10	12	11	12	6	12	12
Influenza	Jan. to May, Nov. to Dec.	June to Oct.	3	10	8	8	10	10	11	10	6	10	10
Scarlatina	Jan. to Apr., Oct. to Dec.	May to Sept.	1	9	10	9	10	12	11	12	6	12	12
Rheumatism	Jan. to June, Dec.	July to Nov.	5	7	6	8	10	8	9	8	6	8	8
Neuralgia	Jan. to Apr.	May to Dec.	4	8	7	8	11	9	10	9	7	9	9
Consumption	Jan. to May	June to Dec.	5	7	6	8	11	8	9	8	6	8	8

* The figures in each of these 11 columns show for how many months out of the twelve months in 1887 the proposition named over the column holds true; thus, concerning bronchitis, the proposition relative to average daily range of temperature held true in only two months out of the twelve; that relative to average temperature, in ten out of twelve, etc.

WARM WEATHER DISEASES.

EXHIBIT XXV.—*Summary Relative to Propositions contained in Exhibits XIX, XXI, etc. (pages 132, 134, etc.), concerning Relations, by Months in 1887, between Greater or less than Usual Prevalence of Diseases named, and certain given coincident Climatic Conditions.*

Diseases.	Months (inclusive) in which Diseases named were More than Usually Prevalent in 1887.	Months (inclusive) in which Diseases named were less than Usually Prevalent in 1887.	For the 12 Months of the Year 1887. Number of Months in which Propositions Hold True.*										
			That in Months when Diseases named were More Prevalent than Usual the Conditions named below were Higher than Usual, and in Months when the Diseases were less Prevalent than Usual these Conditions were Lower than Usual.						That in Months when Diseases named were More Prevalent than Usual the Conditions named below were Less than Usual, and in Months when the Diseases were Less Prevalent than Usual these Conditions were Greater than Usual.				
			Av. Daily Range of Temp.	Av. Temperature.	Abolute Humidity.	Atmospheric Pressure.			Relative Humidity.	Av. Per Cent of Cloudiness.	Ozone.		Velocity of Wind.
						Range.		Average Daily.					
						Monthly.	Av. Daily.				Day.	Night.	
Diarrhea..........	June to Sept....	Jan. to May, Oct. to Dec....	10	11	11	2	1	7	8	9	9	9	11
Cholera Infant...	July to Sept....	Jan. to June, Oct to Dec.....	9	10	10	3	2	8	7	8	8	8	10
Intermittent Fev	April to Oct....	Jan. to March, Nov., Dec......	11	10	10	1	2	4	11	9	7	10	10
Remittent Fever	Aug. to Oct.....	Jan. to July Nov., Dec......	7	8	8	3	4	9	7	7	6	8	8
Typhoid Fever...	August to Dec., Feb.............	March to July, Jan...........	4	5	5	6	7	9	4	3	5	7	5
Typho-mal. Fev.	Aug. to Nov....	Jan. to July Dec..............	6	7	7	4	5	7	6	6	7	9	7
Measles...........	Feb. to July....	Aug. to Dec., Jan..............	8	7	7	6	6	5	6	8	4	5	7
Whooping-cough	Feb ,Mar., May to Aug..........	Jan. Apr., Sept. to Dec...........	8	9	9	4	3	7	6	9	6	9	9
Av. Disease......	Jan. to May, Aug. to Oct....	Nov., Dec., June............	7	6	6	5	6	6	9	7	5	6	6

---

* The figures in each of these 11 columns show for how many months out of the twelve months in 1887 the proposition named over the column holds true, thus, concerning diarrhea, the proposition relative to Average Daily Range of Temperature held true in ten months out of the twelve; that relative to Absolute Humidity eleven months out of the twelve, etc.

TOTAL SICKNESS—AVERAGE DISEASE.

"Average disease" is an average of the tabulated diseases reported present on all the cards received and compiled at this office during the year. It is probably equivalent to the actual sickness from all diseases printed on the report cards, and probably represents very nearly the average sickness from all the diseases in the State. A sample of the report cards on which diseases are reported to this office is found on page 81. Twenty-seven diseases are printed on the cards. In 1887 there were 4,896 of these card reports received. On some of the cards only one or two diseases were reported present; on others twenty or more were reported present. Had each disease (printed on this card, and only the twenty-seven thus named) been reported present on every card received at this office, there would have been 132,192 reports of diseases present. (This is the product of 4,896 reports received multiplied by 27, the number of diseases printed on the cards, or 100 per cent of the possible disease reports.) There were actually present on the cards received at this office only 33,048 disease reports which 33,048÷132,192 of the possible disease reports that might have been present, is 25 per cent. This 25 per cent represents the actual sickness in the State from the tabulated diseases reported present, or in other words the sickness from "average disease." (See Diagram 5, page 129.)

Exhibit XXVI. serves to indicate the probable actual sickness in the State from the tabulated diseases in each year from 1877 to 1886. It compares the sickness in 1887 by months with the sickness by months in each of the ten years 1877 to 1886.

It will be seen by this exhibit that the sickness reported in 1887 was, for the year, and for each month of the year, less than the average reported for the ten years 1877-1886.

EXHIBIT XXVI.—SICKNESS FROM AVERAGE DISEASE, 1877-86.—*By Year and Months for each of the Eleven Years 1877-87. Stating on an Average for such of the 27 diseases tabulated as were reported present, what Per Cent of the Weekly Reports received stated presence of the Diseases, and comparing the Average Per Cents for Months in 1887 with the Averages for corresponding Months in those Years.*

Years, Etc.	Annual Av.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average 10 Years, 1877-86	30	30	31	31	30	28	27	29	32	33	31	30	29
1877	28	27	28	26	24	24	23	26	29	31	30	30	30
1878	30	30	30	31	29	28	26	28	32	35	34	30	32
1879	33	35	36	36	35	30	30	32	37	36	34	34	33
1880	32	32	32	32	31	30	31	34	36	35	32	30	31
1881	33	34	34	32	35	31	30	34	37	36	35	32	31
1882	30	31	30	30	30	29	28	28	30	34	32	31	29
1883	30	30	31	33	33	31	29	29	32	32	29	29	28
1884	29	28	29	30	28	28	29	31	34	34	33	30	29
1885	26	29	29	30	28	25	24	26	27	27	26	26	26
1886	26	26	26	28	27	26	23	26	27	28	25	25	25
1887 (Diagram, page 129.)	25	26	27	28	26	25	24	27	29	26	25	24	24
In 1887 **Greater** than Av. 1877-86	......	....	....	....	....	....	....	....	....	....	....	....	....
In 1887 **Less** than Av. 1877-86	5	4	4	3	4	3	3	2	3	7	6	6	5

RELATIONS OF TOTAL AMOUNT OF SICKNESS TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1.—That in months when **more** than the average per cent of weekly reports stated the presence of such of the 27 diseases tabulated (in tables on pages 86–109) as were reported present, the average daily range of temperature, the average daily temperature, the absolute humidity of the atmosphere, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere, were **greater** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of said diseases those conditions were **less** than the average for the year. In Exhibit XXVII., below, the letter *a* marks exceptions to this proposition for the year 1887.

PROPOSITION 2.—That in months when **more** than the average per cent of weekly reports stated the presence of such of the twenty-seven diseases tabulated as were reported present, the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, and the average velocity of the wind were **less** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of said diseases those conditions were **greater** than the average for the year. In Exhibit XXVII., below, the letter *b* marks exceptions to this proposition for the year 1887.

What per cent of the weekly reports received in 1887 (on an average for such of the tabulated diseases as were reported present) stated presence of the diseases is graphically represented by months in Diagram 5, page 129.

EXHIBIT XXVII.—AVERAGE DISEASE.—*Stating for the Year and for each Month of the Year 1887, what Per Cent of the Weekly Reports of Sickness on an Average for such of the 27 Tabulated Diseases as were Reported Present, Stated Presence of the Diseases, and what were the Meteorological Conditions Observed at Stations in Michigan.**

AVERAGE DISEASE.				Temperature, F.		Humidity of Air.§ Av. of 3 Daily Observations.		Vapor Inhaled and Exhaled from Air-Passages by one Person in 24 Hours, Troy Ounces.		Average Per cent of Cloudiness.	Ozone—Relative Scale of 10°.		Average Velocity of Wind, Miles Per Hour by Anemometer.	Atmospheric Pressure, Inches, Reduced to 32° F.		
														Range.		
Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.		Per Cent of Weekly Reports Stating Presence of.†	Average Order of Prevalence Where Present.†‡	Average Daily Range, by Registering Thermometers.	Average of 3 Daily Observations.	Relative — Per Cent of Saturation.	Absolute—Grains of Vapor in a Cubic Foot of Air.	Inhaled.‖	Exhaled in Excess of that Inhaled.¶		Day Observations, 7 A. M. to 2 P. M.	Night Observations, 9 P. M. to 7 A. M.		Monthly and for Year.	Av. Daily, by 3 Daily Observations.**	Average Pressure.
More than Average Per Cent of Average Disease.	Aug..	29	3.7	20.81	66.41	71	5.22	3.26	8 42	45	3.04	3.02	7.0	*a*.529	*a*.110	29.220
	Mar.	28	4.1	*a*18.02	*a*25.55	*b*79	*a*1.49	.93	10.75	51	*b*3.54	*b*3.53	*b*9.9	1.253	.251	29.238
	Feb..	27	4.0	*a*17.06	*a*21.57	*b*85	*a*1.45	.91	10.77	*b*72	*b*3.29	*b*4.21	*b*11.1	1.643	.415	29.279
	July.	27	3.8	21.91	73.22	70	6.29	3.93	7.75	36	2.85	2.92	7.8	*a*.543	*a*.111	*a*29.176
	April	26	3.9	19.52	*a*42.09	74	*a*2.63	1.64	10.04	*b*56	*b*3.34	*b*3.55	*b*10.7	1.216	.226	*a*29.140
	Jan..	26	3.9	*a*17.96	*a*16.58	77	*a*1.25	.78	10.90	*b*70	3.19	*b*3.81	*b*11.6	1.292	.342	*a*29.105
	Sept.	26	3.7	19.79	57.95	75	4.37	2.73	8.95	49	3.13	3.16	8.4	*a*.632	*a*.174	29.292
	May.	25	3.7	22.52	60.68	70	4.43	2.77	8.91	38	*b*3.20	3.34	7.4	*a*.724	*a*.122	*a*29.191
	Oct. .	25	3.7	*a*16.50	*a*44.46	76	*a*2.98	1.86	9.82	*b*63	*b*3.29	3.39	*b*11.5	*a*1.003	.218	*a*29.175
Average		25	3.7	18.46	44.82	77	3.29	2.06	9.62	56	3.20	3.42	9.6	1.056	.216	29.203
Less than Av. Pr. Ct. of Average Disease.	June	24	3.5	*a*20.68	*a*66.53	*b*75	*a*5.50	2.44	8.24	*b*49	*b*3.01	*b*3.22	*b*6.9	.775	.117	29.190
	Dec..	24	3.5	11.88	27.57	86	1.77	1.11	10.57	83	3.39	3.62	11.0	*a*1.264	*a*.248	*a*29.206
	Nov..	24	3.6	14 80	35.18	78	2.16	1.35	10.33	64	*b*3.15	*b*3.31	11.6	*a*1.591	*a*.255	29.200

*, †, ‡, §, ¶, **. See footnotes with these marks in Exhibit X, page 119.
a An exception to Proposition 1, relating to Average Disease, on page 141.
b An exception to Proposition 2, relating to Average Disease, on page 141.

Exhibit XXVII., continued for a series of years, should show what meteorological conditions are on the whole most conducive to health in Michigan, and what are most to be guarded against by residents in Michigan.

RELATIONS OF CERTAIN METEOROLOGICAL CONDITIONS TO DISEASES OF THE LUNGS AND AIR PASSAGES. AS SHOWN BY STATISTICAL AND OTHER EVIDENCE.*

CONNEXITÉ DE CERTAINES CONDITIONS MÉTÉOROLOGIQUES AVEC LES MALADIES DES POUMONS ET DES VOIES RESPIRATOIRES COMME LE DÉMONTRENT LA STATISTIQUE ET D'AUTRES ÉVIDENCES.

ÜBER DIE BEZIEHUNGEN GEWISSER METEOROLOGISCHER ZUSTANDE ZU DEN KRANKHEITEN DER LUNGE UND LUFTWEGE, WIE SIE DURCH STATISTISCHE UND SONSTIGE BELEGE ERWIESEN.

BY HENRY B. BAKER, A. M., M. D., OF LANSING, MICHIGAN.

One of the reasons for the presentation of this paper is the possibility of bringing forward a kind of evidence not usually obtainable, namely, statistics of sickness over wide areas, and the comparison of those statistics with statistics of the principal meteorological conditions antecedent to and coincident with the sickness. Another reason is the belief of the writer that he has learned some of the reasons why the rise and fall of diseases of the lungs and air passages are, ordinarily, controlled by the temperature and other conditions of the atmosphere. Before stating the reasons why, however, it may be best to make sure that the fact is established that the rise and fall of certain diseases are ordinarily controlled by meteorological conditions. For this purpose I present several diagrams, accurately drawn to scale and based upon statistics carefully and conscientiously compiled; and I ask attention especially to a diagram (No. 4) showing a comparison of over 30,000 weekly reports of sickness, during the eight years 1877-84, with over 150,000 coincident observations of the atmospheric temperature—from which it may be seen that the rise and fall of the sickness from pneumonia in Michigan follow absolutely the fall and rise of the atmospheric temperature. The sickness is reported each week so long as it continues. I believe that is one reason why the line representing sickness from pneumonia follows uniformly later than the line representing temperature. It should, on that account, follow later by a time equal to the average duration of the disease. But if caused in the way I point out, it should follow later, also because the condition which permits the exudation of the albuminous constituents of the blood into the air cells requires, for its production, the continuance of the effects of the inhalation of cold air.

That pneumonia may sometimes result from a sudden and short exposure to cold is not here denied, but it is affirmed that, as a rule, the previous exposure to the inhalation of cold air for a considerable time had prepared the lungs to be thus affected. (This may be more apparant further on.)

The fact that the curves for influenza, tonsilitis, bronchitis and pneumonia are, in general outlines, all practically the same, seems to me strong proof that the controlling cause is one and the same for all these diseases. They are diseases of the air passages, and may be supposed to be influenced or controlled by the atmosphere. The atmospheric conditions which I have found to stand in such relation to all of them as to make it possible that they have causal relation, are the temperature, the absolute humidity, the daily range of pressure and the ozone. Of these conditions the temperature of the atmosphere seems to me to be probably the most important causal condition controlling these diseases. I believe that a large share of its control is through its control of the humidity of the air, and this point I hope to make plain.

---

* Reprinted from Vol. 5, Section XVI., of the Transactions of the Ninth International Medical Congress, held in Washington, D. C., Sept., 1887.

ORDER OF SUCCESSION OF SOME OF THE COLD-WEATHER DISEASES.

I have proved that in Michigan the rise and fall of sickness from pneumonia follow quantitatively the fall and rise of the atmospheric temperature. This is apparent from a diagram (No. 4) which I present. I have shown by diagram (No. 3) that the rise and fall in the sickness from bronchitis, in Michigan, follow the fall and rise of the atmospheric temperature, although not so precisely quantitatively as is the case with pneumonia. By examining the evidence in these two diagrams, it may be seen that throughout the year an average of about forty per cent of the weekly reports stated that pneumonia was under observation, while an average of about sixty per cent of the reports stated that bronchitis was observed. It follows that among persons throughout the State exposed to the same atmospheric temperature, many more are taken sick with bronchitis than with pneumonia. It may also be seen that, as the cold weather approaches in the autumn, bronchitis increases more rapidly than pneumonia, also that it lingers longer in the spring months than does pneumonia. All these facts harmonize if we suppose that a less exposure to low temperature is ordinarily required to produce bronchitis than to produce pneumonia.

In Michigan the sickness from influenza, tonsilitis, croup, diphtheria and scarlet fever, follows more or less closely the fluctuations of atmospheric temperature. It seems necessary to explain how it is possible for a cold atmosphere to cause in one person influenza, in another tonsilitis, in another croup, while in others it favors the contraction of a contagious disease like scarlet fever.* It is probable, however, that the explanation would have been easy long ago except for a misapprehension of one of the principal facts. It has generally been stated that when these diseases were favored by a cold atmosphere, the air was not only cold but damp; and just how cold alone could do so much, or how dampness could favor the production of one of these diseases, has never been explained, notwithstanding the fact that dampness renders the cold more apparent and perhaps more effective. But the fact which has been lost sight of is that cold air is always dry air, absolutely; it is only the relative humidity or percentage of saturation of the air that is great when the air is cold. This is made plain by the study of any table of the absolute humidity showing saturation of air at different temperatures; thus a cubic foot of air at zero Fahrenheit cannot contain more than one-half grain of vapor of water; at 32° F. it cannot contain more than two grains; while at 70° it may contain eight grains, and at 98° F., which is near the temperature of the air passages, each cubic foot of air may contain 18.69 grains of vapor. The influence of cold dry air in the production of "chapped" hands has probably been noticed by most persons, and the stopping up of the nose by drying must have been often observed early in the occurrence of common colds, as also the dry cough which so commonly calls for some medicine to "loosen the cough." But the drying effects of the inhalation of cold air can best be understood by reflecting that each cubic foot of air inhaled at zero F. can contain only one-half a grain of vapor, while when exhaled it is nearly saturated at a temperature of about 98° F., and therefore contains about 18.69 grains of water, about 18 grains of which has been abstracted from the air passages.

---

* In a paper entitled "Some of the Cold-weather Communicable Diseases," published in the *Transactions* of the Michigan State Medical Society for 1887, I have shown that the curves for scarle fever, diphtheria and small-pox follow the inverted curve for temperature.

Coryza.—Thus, cold air falling upon susceptible nasal surfaces tends to produce an abnormal dryness, which may go so far as to cause the "stopping up" of the nose, which may be followed by suppuration. In my opinion a common cold or coryza may thus be caused.

Influenza.—In some persons, under some circumstances, the nasal surfaces may not be susceptible to drying, that is to say, fluids may be supplied in increased quantity to meet the increased demand by the cold dry air, in which case the constant evaporation of the fluids will lead to an abnormal local accumulation of the non-volatile salts of the blood, such as sodium chloride, which is an irritant; and what is termed influenza may then arise. The close relations of influenza and atmospheric temperature are shown in the diagram (No. 1) which I submit herewith. It may be seen that influenza increases promptly in the summer and autumn, as soon as cold weather begins—more promptly than bronchitis or pneumonia does. This order of succession might be expected if these diseases are all caused in the manner pointed out in this paper; but it may, in part at least, be due to the shorter average duration of influenza.

Bronchitis.—The effects which the inhalation of cold dry air have upon the bronchial surfaces will depend greatly upon how the upper air passages respond to the increased demand for fluids; because if they do not supply the moisture the bronchial surfaces will certainly have to sustain an increased demand, in which case, as the phrase is among the common people, a "cold in the head" may then "settle on the lungs," and the person may have bronchitis. The bronchitis which results from the inhalation of cold dry air may be of that sort (like a cold in the head) characterized by an abnormal deficiency of the fluids, at least in the beginning of the disease, or it may be of that sort (like influenza) which is characterized by an excess of fluids, in which case, if the exposure is continued, the evaporation which results from the inhalation of air unusually cold and dry necessarily leads to the abnormal increase in that fluid of the non-volatile salts of the blood.

Pneumonia.—Bronchitis not infrequently precedes pneumonia. The most distinctive feature of lobar pneumonia is the exudation. Certainly the causation of pneumonia is not explained until the manner in which the exudation is caused has been made plain. In papers on the causation of pneumonia I have elsewhere pointed out how such an exudation should be expected to result, in accordance with known laws of osmosis, from long-continued exposure to the inhalation of cold dry air. Since 1850, when Dr. Redtenbacher published his observations,[*] it has been known that during the onward progress of pneumonia chloride of sodium is absent from the urine; and since 1852 it has been known, through the researches of Lionel Smith Beale, [†] of London, England, that the chloride of sodium, which then disappears from the urine of a pneumonia patient, may be found in the sputa and in the solidified lung. I have shown [‡] that during the inhalation of cold dry air the quantity of fluid which passes out from the blood vessels into the air cells must be increased in order to meet the increased demand, and that through the increased evaporation an increasing quantity of the non-volatile salts of the blood may accumulate in the air cells. In connection with the foregoing, I have also pointed out that as soon as the proportion of sodium chloride reaches about three or four per cent. of the fluid in the air cells, the albuminous constituents of the blood should begin to pass out into the air cells.* And thus the chain of explanation of how the exudation which occurs in croupous pneumonia is caused, seems to have been completed.

---

[*] *Zeitschrift der k. k. Gesellschaft der Aerzte zu Wien* Aug., 1850.

[†] Vol. XXXV, Medico-Chirurgical *Transactions*, published by the Royal Medical and Chirurgical Society, London.

[‡] *Transactions* of the American Climatological Association, May 10, 11, 1886, pp. 226–233. Also, *Proceedings* of Michigan State Board of Health, Oct., 1886, pp. 7-11.

The law of osmosis, in accordance with which albuminous exudations occur whenever the fluid exterior to the blood vessels contains about four per cent of sodium chloride, probably applies, as a rule, to exudations throughout the air passages, and so I will not repeat it in connection with coryza, influenza, tonsilitis, croup and bronchitis. Indeed, the law probably applies in all diseases and throughout the human body; but it seems probable that there are other conditions which favor the exudation of the albuminous constituents of the blood, such conditions, for instance, as cause a breaking down or change in the albuminous constituents themselves, variation in the blood pressure through variations in the atmospheric pressure; and it is not difficult to see that blood pressure may be increased locally, as, for instance, through disturbed action of the heart, and, finally, an important factor in the causation of pneumonia and of exudation throughout the air passages, is undoubtedly the more or less complete paralysis of parts directly exposed to unusual cold, which may subsequently occur on their being subjected to warmth.

Bearing upon the subject of the influence of atmospheric pressure in favoring pneumonia, I submit a diagram (No. 7), which shows that, in Michigan, the curve for the average daily range of atmospheric pressure coincides very nearly with the reversed curve for the temperature, and that the sickness from pneumonia follows it somewhat closely, but not as closely as it does the temperature, perhaps, however, because the statistics relative to pressure do not cover sufficient time to obtain a correct average.

My researches appear to prove that pneumonia, whether croupous or catarrhal, seems to be controlled by the atmospheric temperature. It, therefore, seems true, as many have long believed, that for both forms the causation is similar. From my standpoint it seems possible that in the catarrhal form the sodium chloride in the fluid which moistens the air cells, does not reach or much exceed the three or four per cent, which is required in order that the ordinary albuminous constituents of the blood should begin to pass out into the air cells, as it does in croupous pneumonia. It also seems possible that lobar pneumonia may require for its production that partial paralysis which results from the experience of a warm atmosphere immediately following exposure to cold (such an effect as is seen in the flushed cheek of a person brought into a warm room from extreme cold outer air), in which case the exudation should occur in just that part of the lungs supplied by the nerve influenced by the cold, because the walls of the blood vessels of just that part should be relaxed. The chill may result from such a disturbance of the nervous equilibrium, and be in the nature of an attempt to regain control of the relaxed blood vessels.

---

* "But a substance like albumen, which will not pass out by exosmosis toward pure water, may traverse a membrane which is in contact with a solution of salt. This has been shown to be the case with the shell membrane of the fowl's egg, which, if immersed in a watery solution containing from three to four per centum of sodium chloride, will allow the escape of a small proportion of albumen. Furthermore, if a mixed solution of albumen and salt be placed in a dialysing apparatus, the salt alone will at first pass outward, leaving the albumen; but after the exterior liquid has become perceptibly saline, the albumen also begins to pass in an appreciable quantity." John C. Dalton, "Treatise on Human Physiology for use of Students and Practitioners," etc., Philadelphia, 1875, p. 363.

Elsewhere* I have shown—and it may be seen by diagrams 8 and 9—that a few communicable diseases, which, as a rule, gain access to the body through the air passages, are quantitatively related to the atmospheric temperature, almost invariably rising after the temperature falls, and falling after the temperature rises. The explanation has seemed to me to be that those exudations which result from the inhalation of air colder than usual supply a *nidus* for the reception and reproduction of the specific contagia of scarlet fever, small-pox, etc.

Inasmuch as diseases known to be contagious follow so exactly the fluctuations of atmospheric temperature, that pneumonia is also controlled by the temperature is no proof of the non-contagiousness of pneumonia; but all, or nearly all, of the phenomena of pneumonia are now accounted for without reference to a special contagium, and the same can be said of bronchitis, influenza and the other diseases of the upper air passages.

BEARING UPON DIET AND TREATMENT.

If, as I believe, nearly all of the diseases of the air passages, and some contagious diseases which gain entrance to the body through the air passages, are associated with unusual evaporation of fluids from their surfaces, and the accumulation there of the non-volatile salts of the blood which act as irritants, and which, when in sufficient quantity, cause the exudation of the albuminous constituents of the blood, these facts have an important bearing upon the subject of diet best adapted to freedom from these two classes of diseases; for it is obvious that in a person whose blood is strongly saturated with sodium chloride or other fixed salt, the exudations may be quite different from those in a person whose blood is only scantily supplied with fixed salts.

If these views are found to be correct—namely, that trouble comes from the accumulation of the non-volatile salts in the air passages—they may help to explain why in practice a volatile salt, like ammonia, has sometimes been preferred to a salt of a fixed alkali, and why such a volatile substance as carbonate of ammonia has been preferred by some as even more satisfactory than the chloride of ammonium in the treatment of certain acute affections of the air passages.

The importance of ascertaining the controlling causes of this large class of diseases seems to warrant analyses of the fluids transuded in influenza and in bronchitis, and such other experiments by those who have opportunity as shall prove or disprove the views here set forth.

PREDISPOSING CAUSES—HYPERINOSIS AND PNEUMONIA.

Chemically, fibrin is oxidized albumen. It should not, therefore, be difficult to infer the direction in which we must search for the causation of hyperinosis, namely, in the direction of the causation of abnormal oxidation of the blood. This condition of the blood occurs in pneumonia, in rheumatism and in certain other diseases, and is believed by some to constitute an inflammatory condition of the blood—a tendency toward inflammation. Thus in Aitken's "Science and Practice of Medicine," Vol. II, page 508, Dr. Parkes is quoted as saying: "That hyperinosis is really anterior in pneumonia as in rheumatism, must, in spite of the opinion of Virchow, be considered likely from experiments, among others, of Prof. Naumann, of Bonn." It is conceivable that abnormal oxidation of the blood serum may result from an abnormal proportion or activity of the red blood corpuscles. In the same paragraph quotation from Dr. Parkes it is said: "It is well known how frequently the liver is affected in pneumonia, so that some amount of jaundice is not at all uncommon, and sometimes bile pigment appears in the pneumonic sputa. I have also found in some cases evidence of liver affection for some time before the lung disease, especially the so called torpor with deficient biliary flow." * Whenever the production of red corpuscles continues at the normal rate, and they are not destroyed in the liver as fast as they normally are, it would seem that their accumulation may favor excessive oxidation of the albuminous constituents of the blood serum, in a condition described by the word hyperinosis. But it is still more conceivable that abnormal oxidation of the blood serum may result from the inhalation of oxygen in greater than normal amount, or in a condition of unusual activity, and ozone is oxygen in such an active condition. Furthermore, the curve for the rise and fall of atmospheric ozone is, in Michigan at least, almost precisely the curve for the rise and fall of pneumonia. (It is probable, however, that the quantity of residual atmospheric ozone is controlled by the atmospheric temperature.) It may be added, also, that the late Dr. Henry Day, of London, England, claimed that his experiments with dogs proved that the inhalation of ozone caused bronchitis, and in larger quantities, pneumonia.

---

* "Some of the Cold-weather Communicable Diseases," in *Transactions* of the Michigan State Medical Society, 1887.

While, therefore, I do not claim that atmospheric ozone is the sole cause of pneumonia, it seems quite probable that it may be a cause of hyperinosis, which is apparently a predisposing cause of pneumonia and of other diseases. It seems reasonable to believe also that an exudate, which under other conditions would be readily reabsorbed or taken away by the lymphatics as rapidly as formed, may, under the influence of the abnormal oxidizing action of ozone become too insoluble to be thus disposed of, and consequently accumulate as the fibrinous exudate in pneumonia, in pleuritis, in croup, etc., and also serve as a *nidus* for any contagium inhaled.

In Michigan the curves for sickness and for deaths from pulmonary consumption seem to follow irregularly the inverted temperature curve, about one to three months later in time. Consumption thus seems to be influenced by the same meteorological conditions as is pneumonia. In this connection and in connection with what has been said as to the difficult removal of oxidized exudates, it is worthy of notice that Dr. H. F. Formad, of Philadelphia, has claimed that a structural condition predisposing to consumption is abnormally few and narrow lymph spaces in the connective tissues.† All of these alleged facts seem to be in harmony with what I have suggested as to the fibrinous *nidus* being the controlling cause of certain communicable diseases which enter through the air passages.

---

* Aitken's "Practice," Vol. II, p. 508.

†"Tuberculosis usually ensues when a simple inflammation is set up by any kind of injury, in animals with the structural peculiarities that I have described; but tuberculosis cannot be produced in animals which do not have this structural peculiarity, so far as my experiments show, unless the injury is inflicted upon serous membranes."—*Journal of American Medical Association*, Vol. II, p. 148.

Pulmonary Consumption.—But with a contagium which enters the body, but not through the air passages, if it is capable of entering the general circulation it is probably capable of passing from the circulation to any exudate; so the formation and especially the retention of such an exudate in the lungs and air passages would be expected to supply the conditions for the rapid multiplication of any such contagium. In this connection I submit a diagram (No. 11) showing that in Michigan the sickness reported from pulmonary consumption follows the inverted temperature curve with considerable regularity, except that in the summer and autumn months it is separated from the temperature by a shorter period of time than it is in the winter and spring. The sickness under observation (which includes old cases) will be lessened by the deaths, and this should be especially noticed when the conditions favoring deaths do not also equally favor the production of new cases, as may be the fact on the approach of warm weather. However it may be, the curves for deaths need to be studied. I regret that the deaths in Michigan are not all reported, and the omissions are greater in the earlier months of each year; but in a diagram which I have prepared, it may be seen that after making a correction for the omissions (estimated by comparison with census statistics) the curve for deaths is somewhat similar to the curve representing sickness. Relative to deaths, however, more satisfactory evidence is presented to you in the diagram (No. 10), representing the relation of the deaths from phthisis in London, England, during thirty years, from which it is plain that the curve for deaths from phthisis follows the inverted temperature curve with great regularity.

Returning now to the curve for sickness from consumption in Michigan (Diagram 11): If in the summer months the reduction of the sickness by reason of the deaths is as great as the reduction by reason of the warmer weather, the curve for sickness should show, as it does, a more than average decrease, in fact, a double decrease after the great death rate, which culminates in April; but this double decrease will soon change to less than average decrease, and then, as soon as there is an increase in sickness to more than average increase, culminating at the time of least deaths—which, in Michigan, seems to be in October, but in London is unmistakably in September—then, as the deaths increase, the sickness under observation (old cases and new cases) should not increase as fast as it otherwise would. This may serve to explain why the curve for sickness drops from its maximum in April to its minimum in August in four months, while it occupies double that number of months in going from its minimum to its maximum, which it does not reach until April, but which it might reach in March if the great number of deaths then did not keep it down.

WHAT IS PROVED?

It is useful to "take account of stock," as the merchants do at the close of the year, and ascertain just what is the state of our knowledge. In science I understand that a proposed mode of causation is considered proved when (1) it is demonstrated that the cause assigned is a *vera causa*—a true cause, capable of causing the phenomena ascribed to it; (2) that the cause assigned is present and acting, and (3) that no other known cause capable of causing the phenomena is present and acting. That chloride of sodium in strong solution is an irritant and a poison is a well-known fact, and the mode of death of animals poisoned therewith has been made the subject of experimental study.[*] That whenever a fluid containing a non-volatile salt is evaporated there is left a residue of salt, is now a part of our most common knowledge; this is implied by the term "non-volatile." That the blood serum and the fluids of the human body contain non-volatile salts has been demonstrated by many analyses. That the quantity of vapor of water which air can contain is dependent upon the temperature is one of the most well-known facts in meteorology, and that raising the temperature of air increases its capacity for moisture is equally well known. When cold air, which can contain only a small quantity of vapor of water, enters the air passages, and before it is exhaled is warmed, so that it can contain a large quantity, and is constantly in contact with moist membranes, from which it can take vapor of water—that it should take the moisture, and leave a residue of non-volatile salts, is in accordance with all our knowledge and experience on this subject. Finally, in pneumonia the increased non-volatile residue has actually been found, by analyses, in the sputa and in the solidified lung.[†]

It seems to be demonstrated that the alleged evaporation of fluids containing non-volatile salts takes place, and that the salt is "present and acting" in the air passages. (It does not change this fact if we admit that, normally, the residue left by evaporation is constantly reabsorbed or removed through the lymph channels; because it is possible that, when formed faster than normal, the lymph channels are not capable of removing the residue, or, if removed through them, the irritation may cause œdema sufficient to close those channels.[‡])

Considering that the temperature of the air exhaled from the air passages is always nearly the same, it would appear that the residue of non-volatile salts in the air passages should be quantitatively related to the temperature of the air inhaled—that is, to the temperature of the atmosphere. That the sickness from several diseases of the air passages is quantitatively related to the temperature of the atmosphere is demonstrated by the statistics which I have presented. I know of no cause, other than the one I assign, capable of causing the irritation of the air passages, so as to control the rise and fall of coryza, influenza, tonsilitis, croup, bronchitis, pneumonia, and apparently also pulmonary consumption. For myself, therefore, it is proved (1) that the cause assigned is a true cause; (2) that it is present and acting when these diseases are caused, and that it is not only qualitatively but quantitatively related to these diseases; (3) that no other known cause is present and acting, even if we refer to each disease singly, and much less is there present any other known or alleged cause capable of inducing all of these diseases.

It has been objected that it has not been proved that evaporation from the air passages extends to "parts so remote from the outer air as the pulmonary alveoli."[§] While it may be difficult to demonstrate this experimentally, I submit that it is susceptible of proof, as follows: Pneumonia rises and falls in relation to the atmospheric temperature in ways similar to those of the diseases of the upper air passages; if the diseases of the *upper air passages* are due to a non-volatile residue left by excessive evaporation, there is no other known cause "present and acting" to account for the pneumonia which is coincident therewith. Furthermore, the increased non-volatile residue having actually been found, by analyses, in the sputa and in the solified lung of the person dead from pneumonia,* this alone amounts to nearly complete proof that the evaporation occurred, because (1) the evaporation of the fluid containing it is known to leave such a residue, and (2) there is no other known cause of the abnormal accumulation there of such a residue as the chloride of sodium Finally, to assume that evaporation of moisture does not extend to the pulmonary alveoli is to assume that the air inhaled reaches its highest temperature before it reaches the alveoli, and that it is fully saturated with moisture at that highest temperature before it reaches the alveoli, neither of which assumptions is probably true, because the air comes most nearly in contact with the warm and fluid blood in the alveoli themselves.

---

[*] By B. J. Stokvis. In *Archiv für Experimentelle Pathologie und Pharmakologie*, *Band* 21, *Hefte* 2, *und* 3, *Seite* 170-218.

[†] By Lionel Smith Beale. *Transactions* Royal Medical and Chirurgical Society, London, England, 1852, Vol. xxxv, pages 325-375.

[‡] Interesting in this connection are the researches of Dr. H. F. Formad, of Philadelphia, which, he claims, prove that few and narrow lymph spaces in the connective tissue constitute a structural predisposition to tuberculosis.—*Journal of American Medical Association*, Vol. ii, page 148. And in *Archiv für Experimentelle Pathologie und Pharmakologie*, Dr. Stokvis has shown that animals fatally poisoned by sodium chloride invariably have œdema of the lungs.

[§] *New York Medical Journal*, Aug. 13, 1887, page 186.

There may be no necessity for any further attempt to account for the fibrinous or albuminous exudations which occur in some or all of these diseases; the irritation by an abnormal proportion of non-volatile salts may be sufficient; but the fact that albumen will pass to a four per cent solution of sodium chloride may well be kept in mind in connection with this subject.

I consider it proved, then, that the rise and fall of the diseases of the air passages are controlled by the atmospheric temperature, and that this is accomplished mainly through the quantity of vapor of water abstracted from the air passages. At the same time the mere evaporation of the water is probably harmless except it leaves an abnormal residue of non-volatile salts, which probably it may most readily do in persons whose blood is abnormally saturated with such non-volatile salts as usually pass out by way of the kidneys, and of which sodium chloride may be named as an example.

THE READING OF THE DIAGRAMS.

For the convenience of those who use the following diagrams, it may be stated that they are to be read with reference to the figures in the right and left hand margins, the numbers indicating the temperature being on the right and those representing the sickness or deaths, as the case may be, on the left. Thus, in Diagram No. 1, it will be seen that in the month of January, the average atmospheric temperature for ten years was 20.56°, and in the same month the average percentage of reports which stated the presence of influenza was 55. In February the average atmospheric temperature was 23.62°, he percentage of reports stating the presence of influenza was 61. In August, when the curves for atmospheric temperature and sickness both reached their lowest point (the curve for temperature being reversed), the percentage of reports stating presence of influenza was 21, while the average atmospheric temperature was 68.14°.

As an illustration, the table giving by months the average atmospheric temperature and the influenza (from which Diagram No. 1 is constructed) is given herewith:—

TABLE 1.—*Stating, by months, for the ten years, 1877-86, the average percentage of reports stating the presence of influenza in Michigan, also the average atmospheric temperature for the same period.*

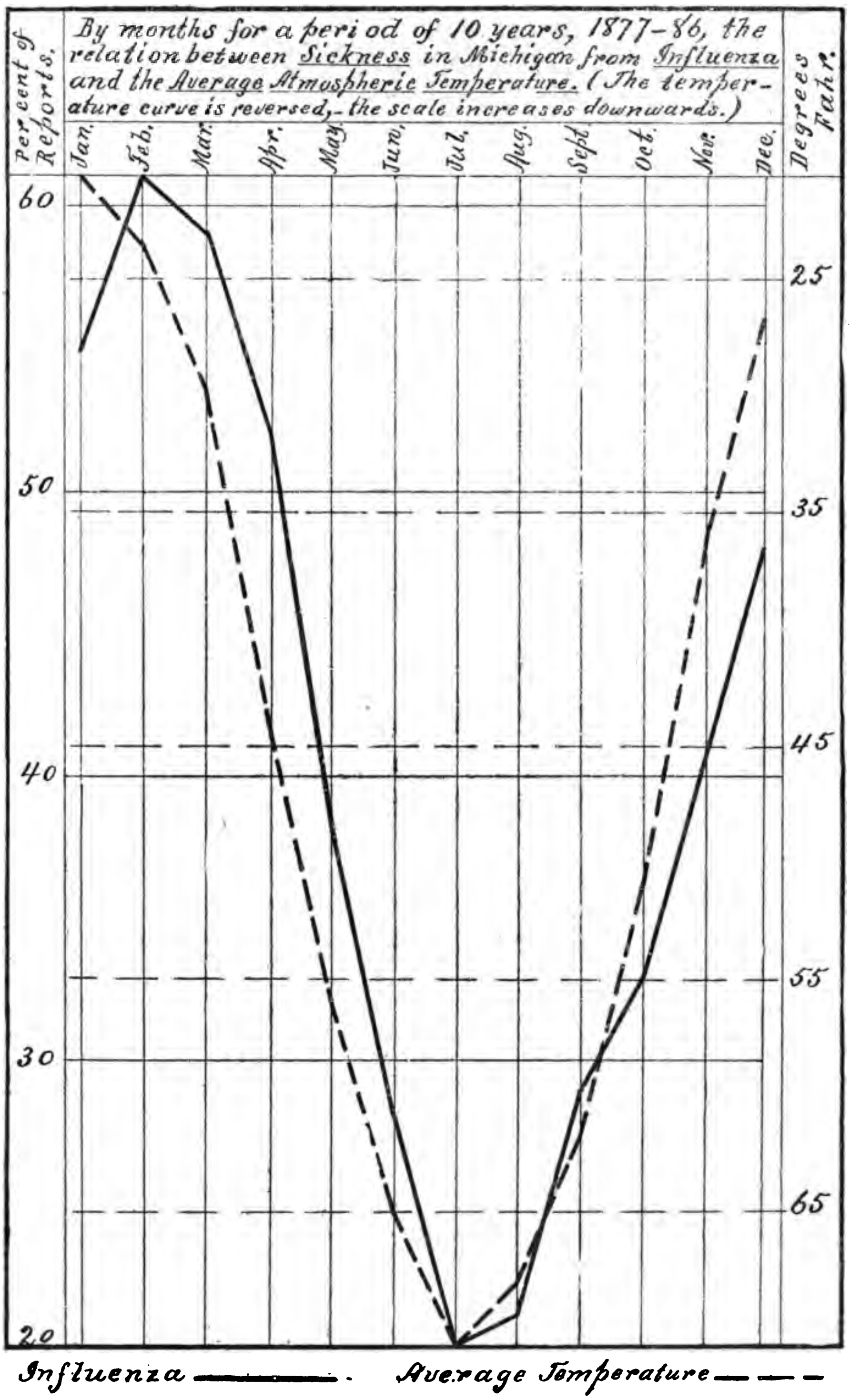
Ten years, 1877-86.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Percentage of weekly reports stating presence of influenza..................	55.	61.	59.	52.	38.	28.	20.	21.	29.	33.	41.	48.
Av. atmos. temp., degrees Fahr......................	20.56	23.62	29.80	44.33	56.08	65.10	70.52	68.14	61.67	50.83	36.04	26.60

For an exact reading of the figures, the tables which accompany the paper should be studied; but the relations of the temperature in one month to the sickness in that month or in a succeeding month can best be seen from the diagrams. In these diagrams, in which the unit of time is one month, and the curve representing sickness is made from reports of all cases under observation, old cases as well as new cases, the sickness curve should coincide with a curve representing a controlling cause of that sickness if the duration of the disease is less than one-half month, and the disease has no period of incubation, otherwise the curves may be separated by an interval corresponding, as nearly as the long unit of time will permit, to the average duration of the incubation and the sickness.

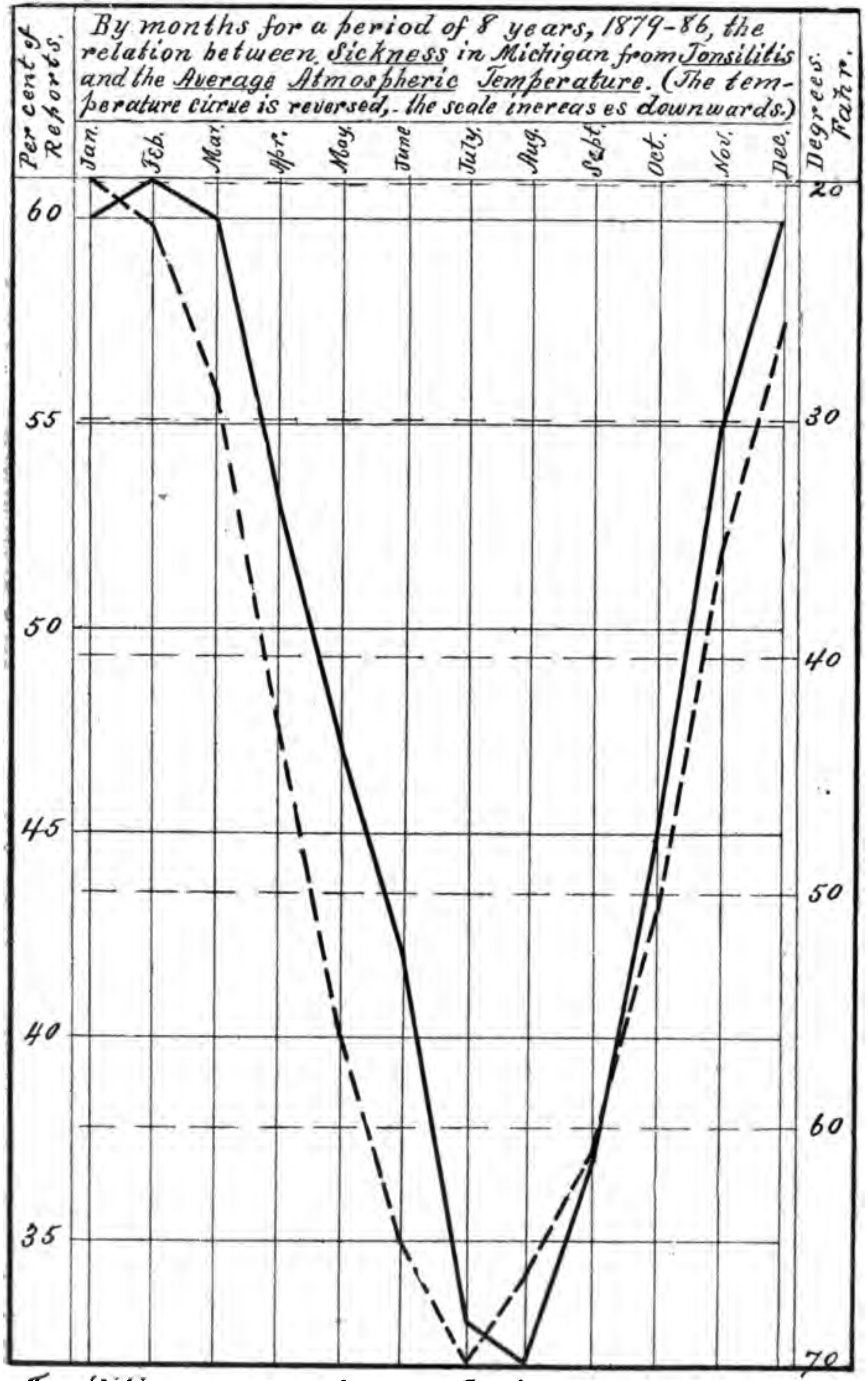
---

* By Lionel Smith Beale. *Transactions* Royal Med. and Chirurg. Soc., London, England, 1852, Vol. xxxv, pages 325-375.

NO. 71.—TEMPERATURE, AND SICKNESS FROM INFLUENZA IN MICHIGAN.

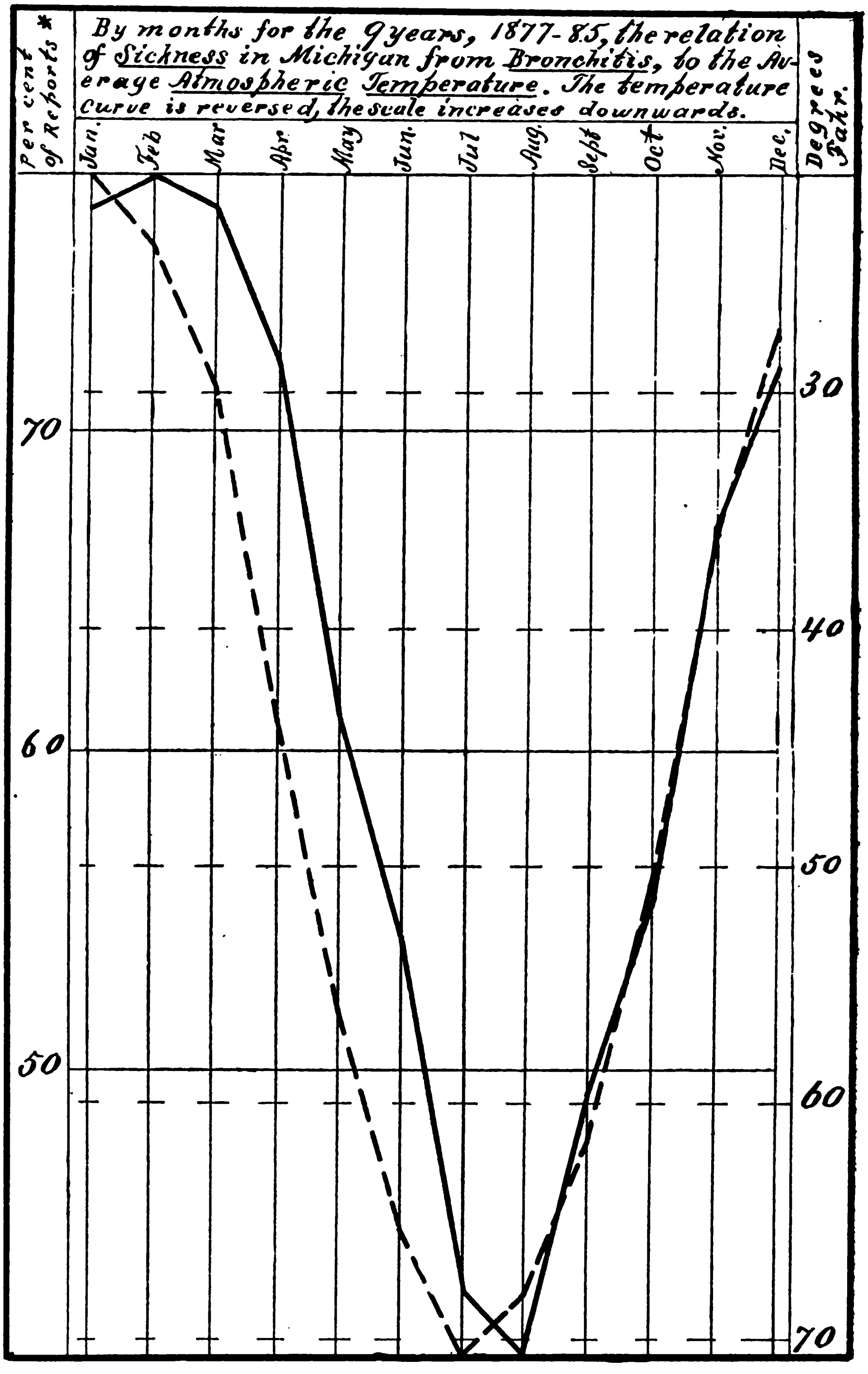


NO. 2.—TEMPERATURE, AND SICKNESS FROM TONSILITIS IN MICHIGAN.



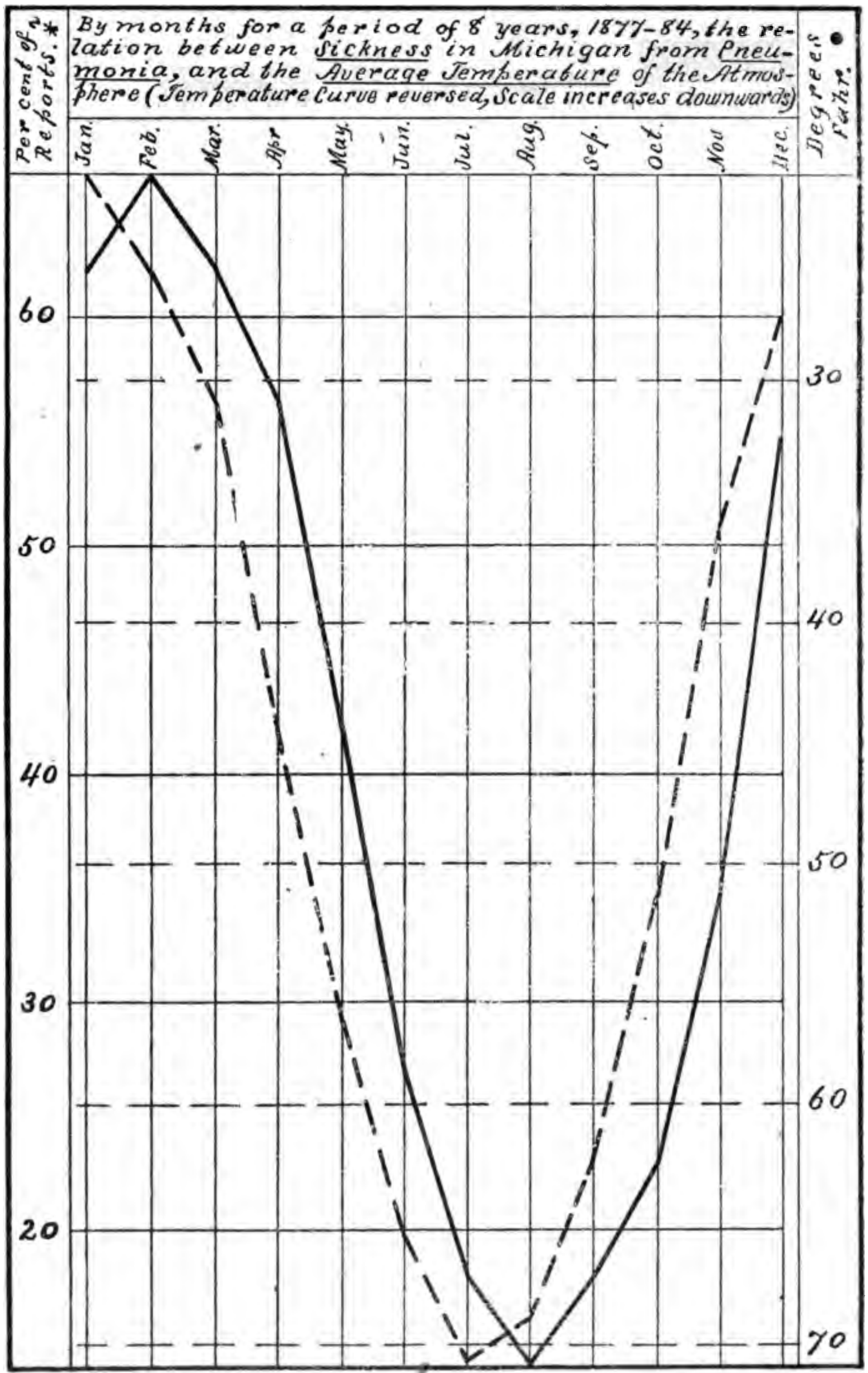
Tonsilitis ———— Average Temperature — — —

NO, 8.—TEMPERATURE, AND SICKNESS FROM BRONCHITIS IN MICHIGAN.



Bronchitis ————. Average Temperature — — —.
* Indicating what per cent of all reports received, stated the presence of Bronchitis then under the observation of the physicians reporting.
Over 35,000 weekly reports of sickness, and about 173,000 observations of the atmospheric temperature are represented in this 'agram.

NO. 4.—TEMPERATURE, AND SICKNESS FROM PNEUMONIA IN MICHIGAN.

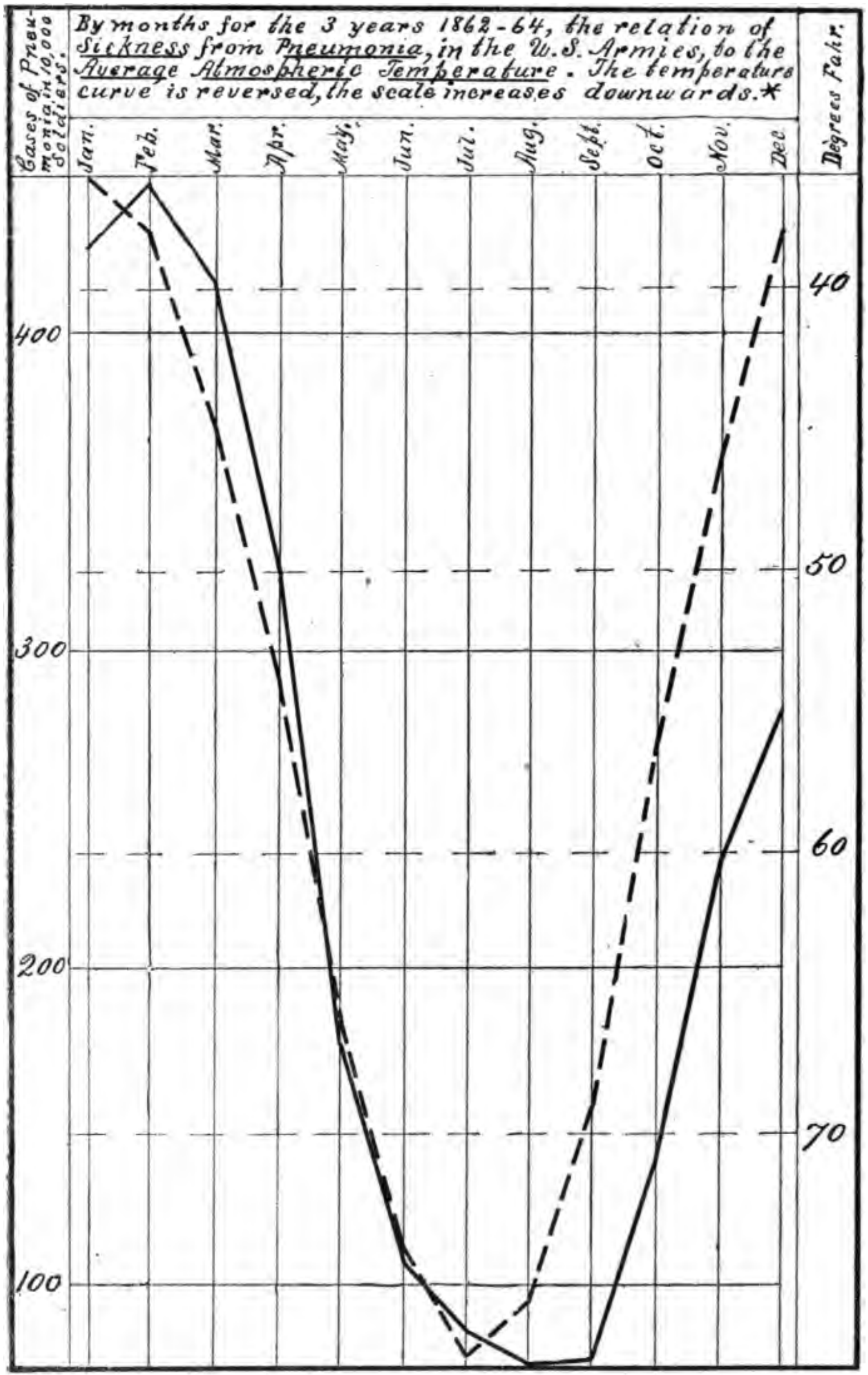


Sickness from Pneumonia ———. Average Temperature — —

*Indicating what per cent of all reports received, stated the presence of pneumonia then under the observation of the physicians reporting.

● Over 30,000 weekly reports of sickness, and over 150,000 ● observations of the atmospheric temperature are repre-represented in this diagram.

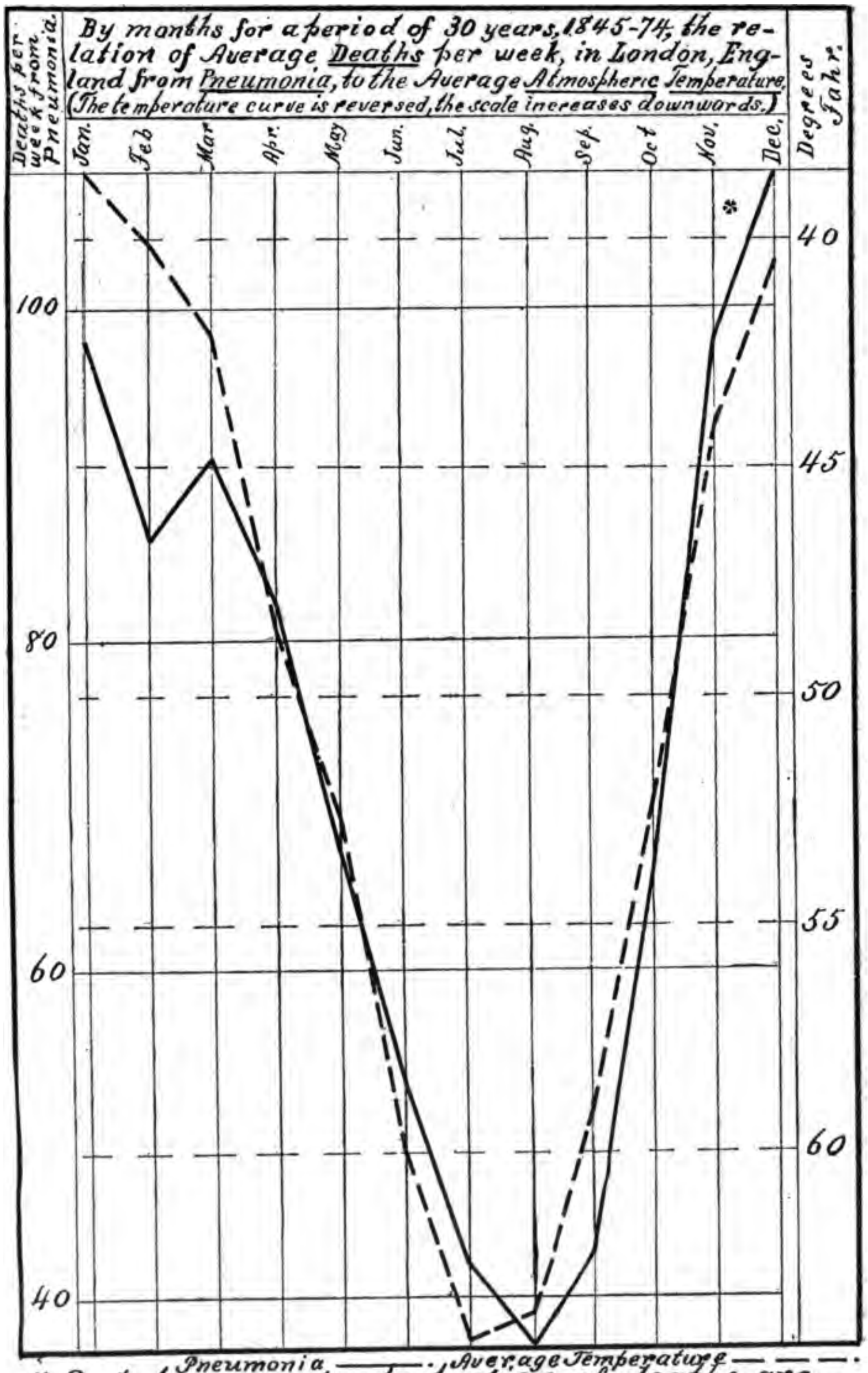
NO. 5.—TEMPERATURE AND SICKNESS FROM PNEUMONIA IN U. S. ARMIES.



Sickness from Pneumonia ——. Average Temperature — — —

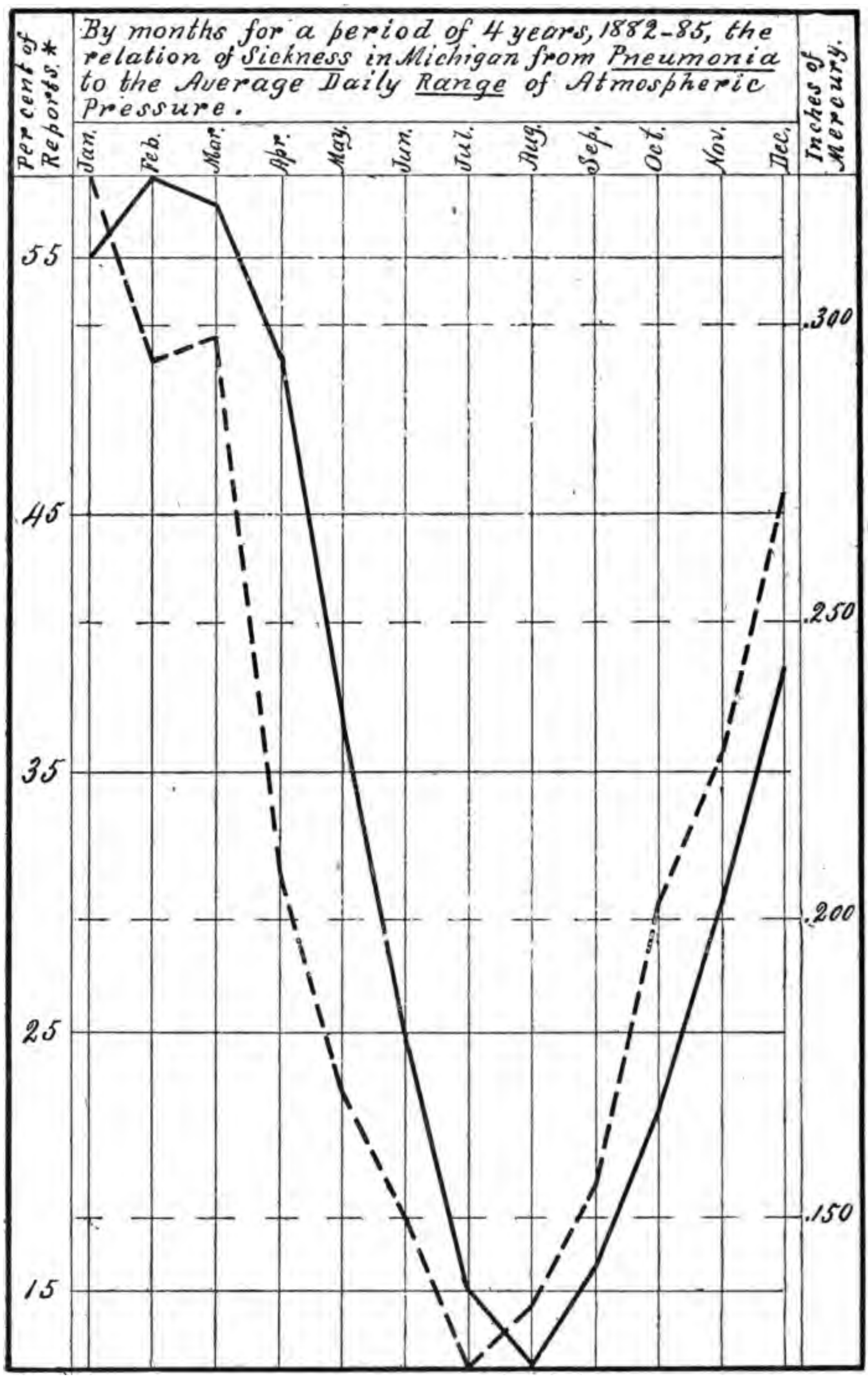
* The temperature curve is made from the normals at six stations representing approximately the localities occupied by the armies of the United States.

NO. 6.—TEMPERATURE AND DEATHS FROM PNEUMONIA IN LONDON.



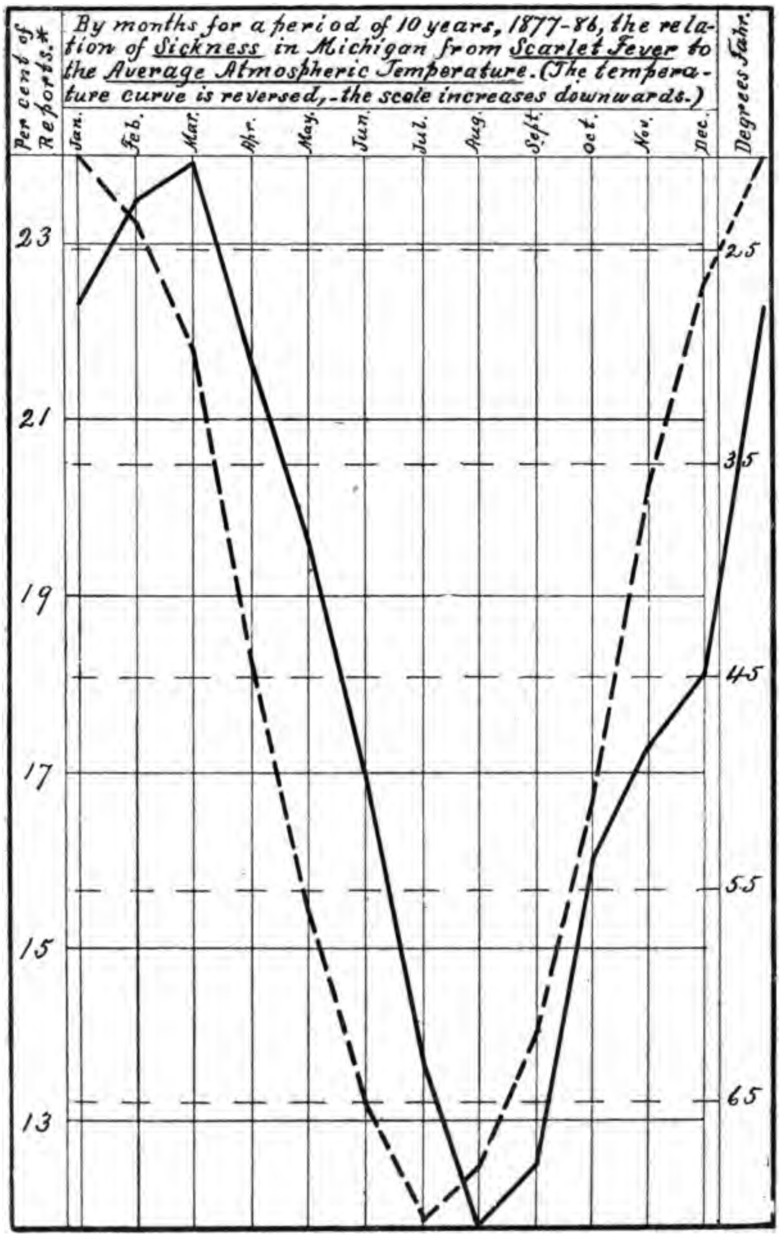
* Perhaps a greater proportion of deaths are returned for the later than for the earlier months in each year?

NO. 7.—DAILY RANGE OF BAROMETER, AND SICKNESS FROM PNEUMONIA.



Sickness from Pneumonia ———. Av. daily range of Barometer — — —.
* Which stated that Pneumonia was under the observation of the physicians who made reports.

NO. 8.—TEMPERATURE, AND SICKNESS FROM SCARLATINA IN MICHIGAN.

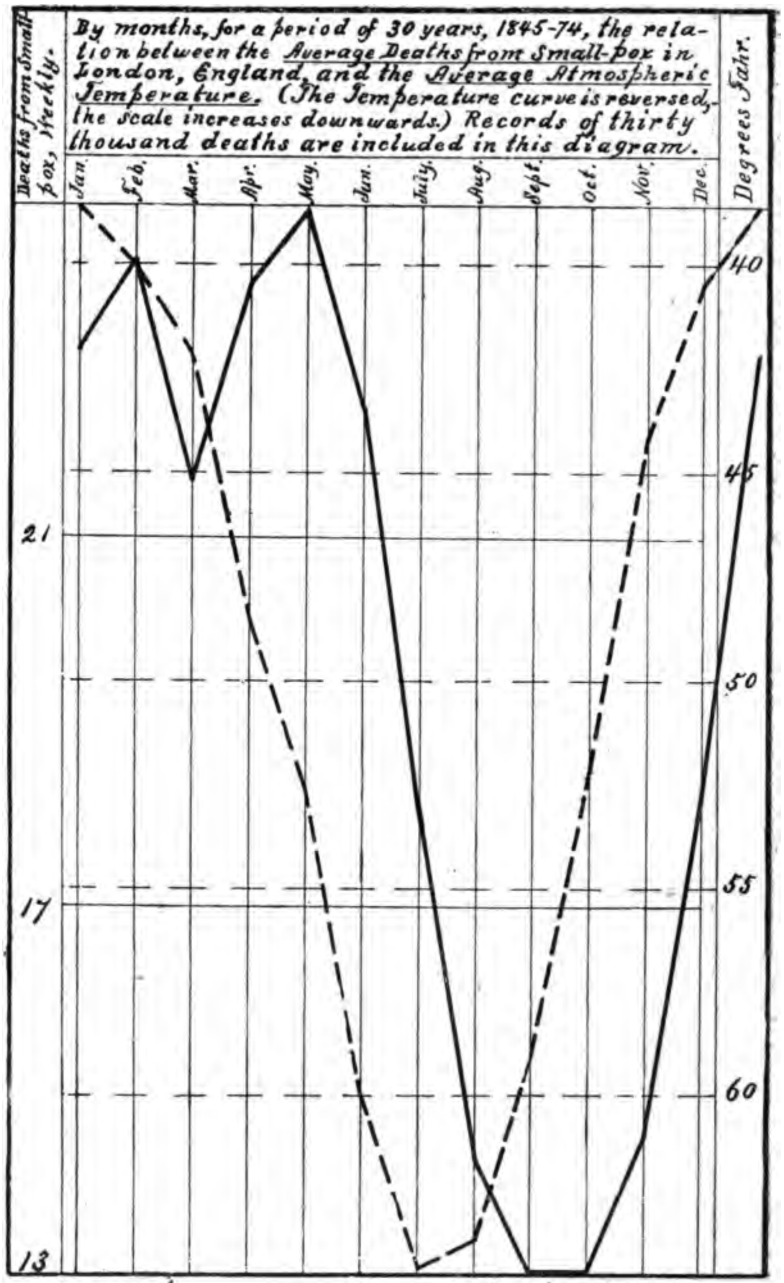


Scarlet Fever ————. Average Temperature — — —.

*Which stated that Scarlet Fever was under the observation of the physicians who made reports.

Over forty-one thousand weekly reports of sickness and over 190,000 observations of the atmospheric Temperature are represented in this diagram.

NO. 9.—TEMPERATURE, AND DEATHS FROM SMALL-POX IN LONDON.



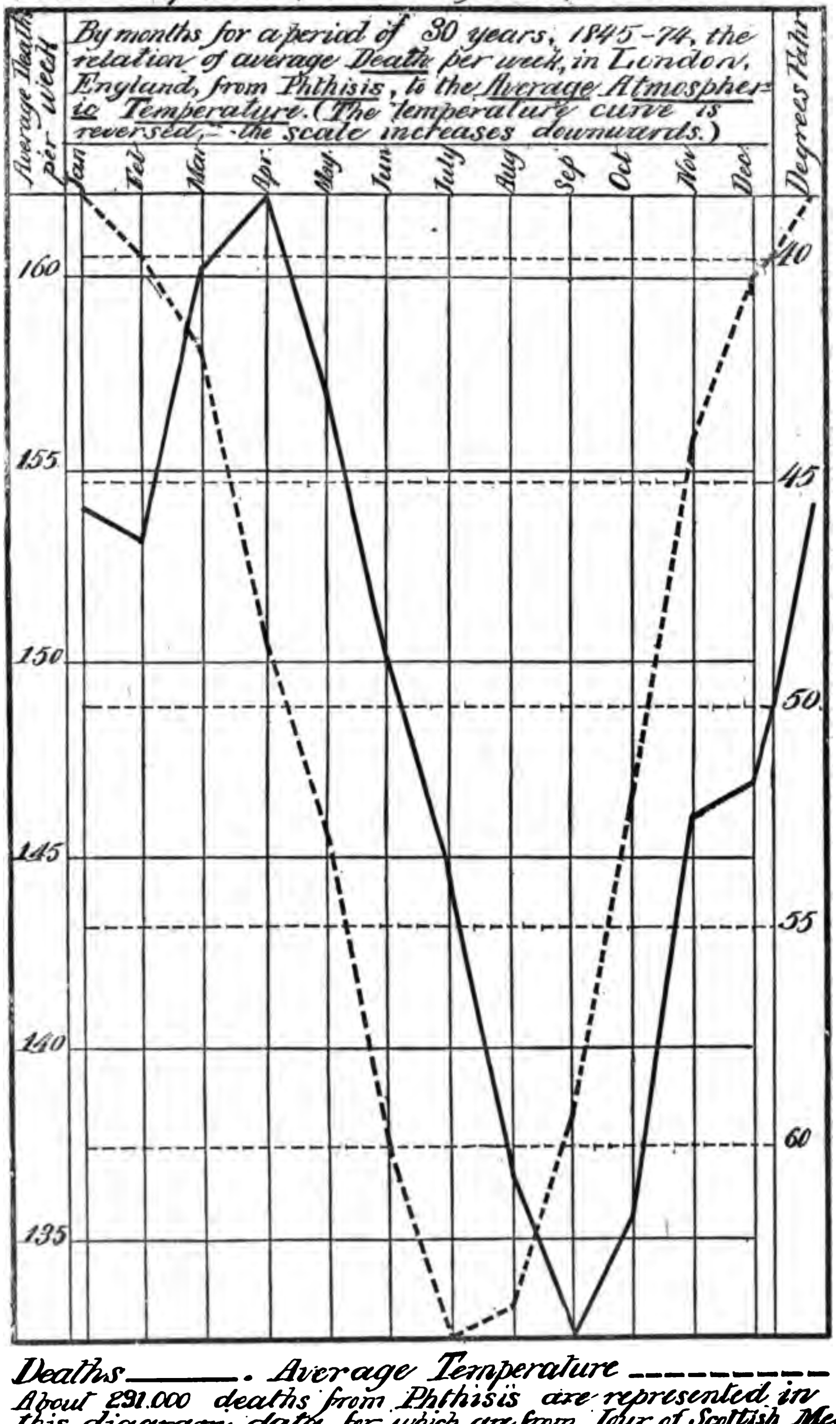
By months, for a period of 30 years, 1845-74, the relation between the Average Deaths from Small-pox in London, England, and the Average Atmospheric Temperature. (The Temperature curve is reversed,—the scale increases downwards.) Records of thirty thousand deaths are included in this diagram.

Small-pox ———— . Average Temperature — — —.

Except in a few months the Small-pox follows two months later than the temperature changes.

The line representing Small-pox should follow as long a time later than a line representing its controlling condition as is the average duration of the fatal cases plus the period of incubation?

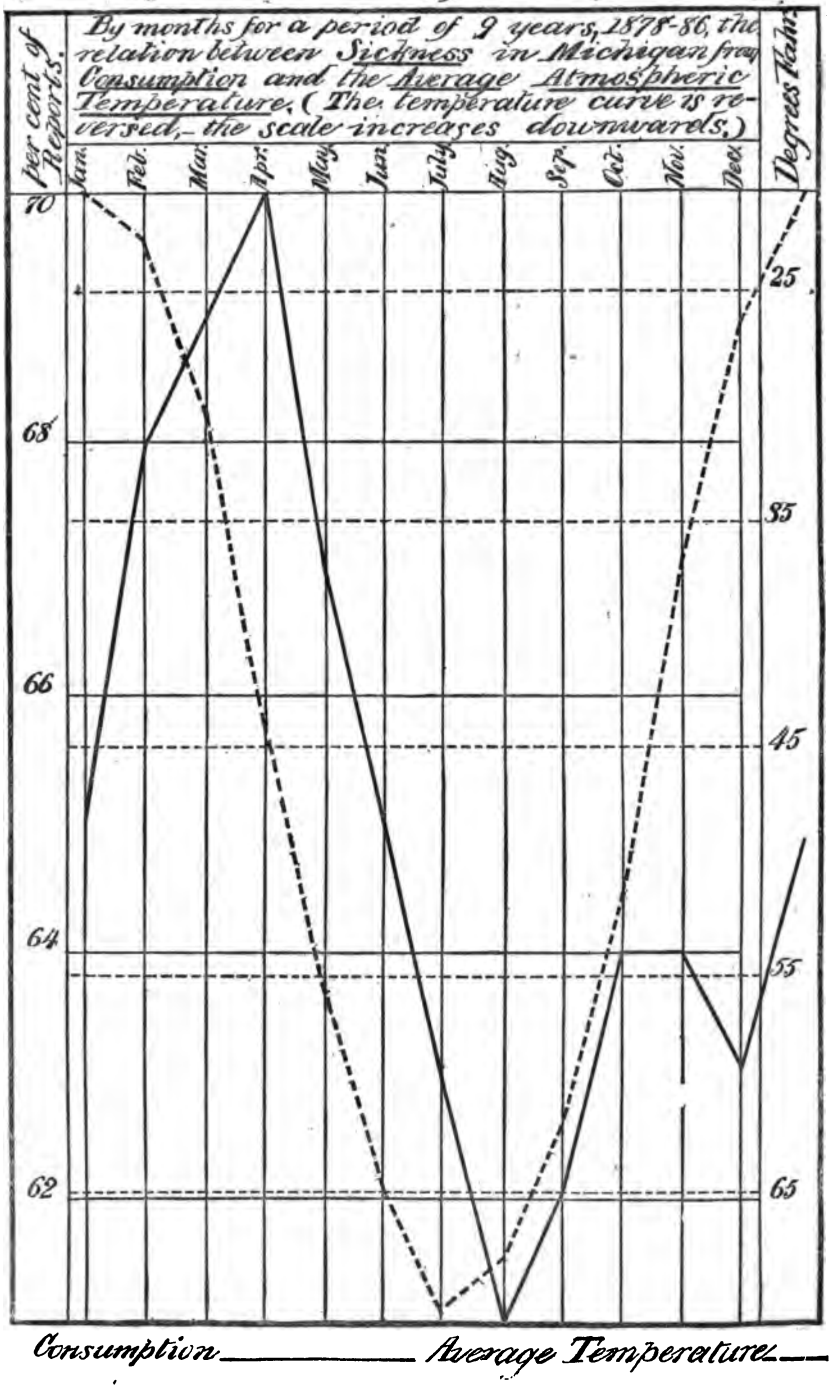
No 10 — Temperature, and Deaths from Phthisis in London.



Deaths ———. Average Temperature - - - - - - - -

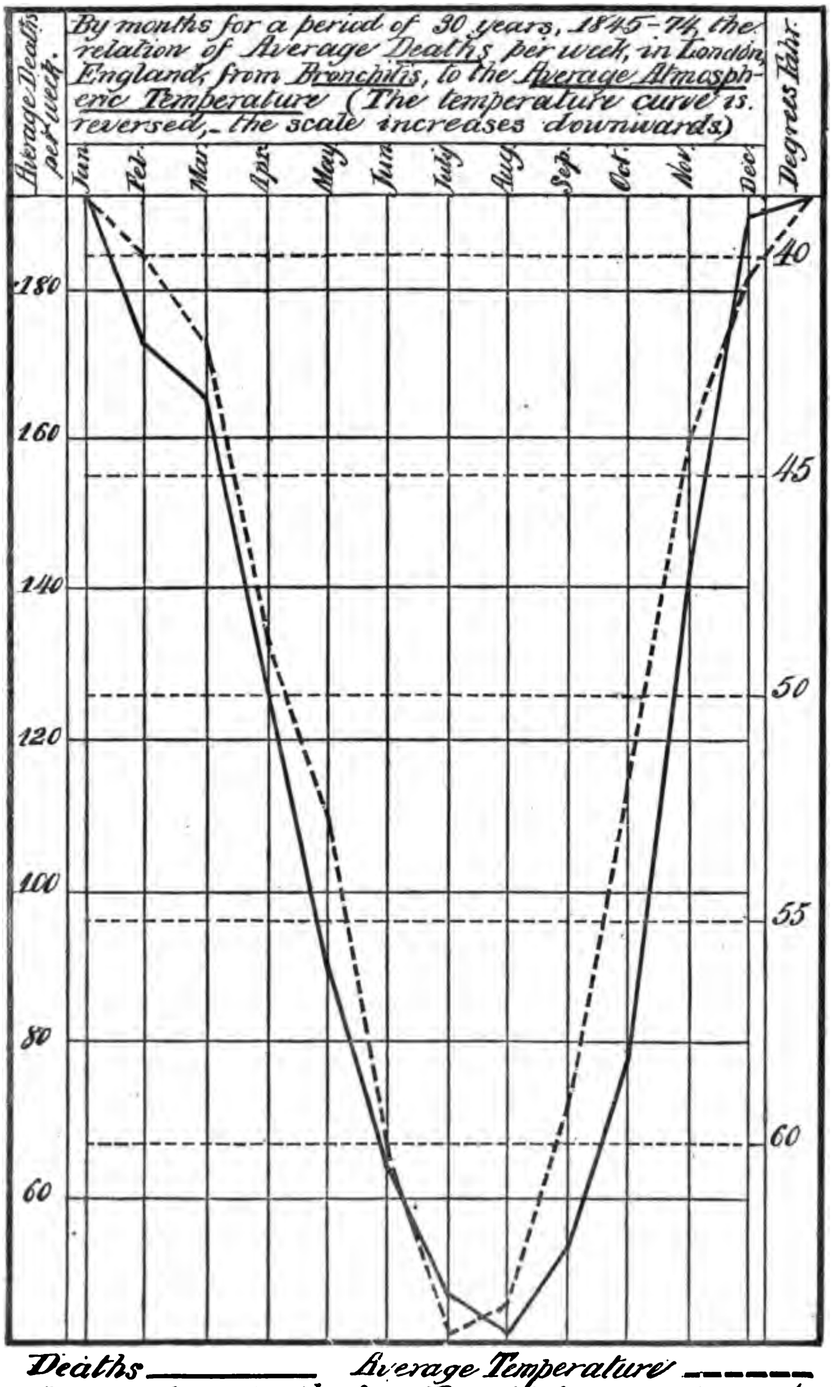
About 291.000 deaths from Phthisis are represented in this diagram data for which are from Jour. of Scottish Met. Soc., New Series Nos XIIII, XIIV, XLV, XLVI, pages 262 and 263.

No 11 Temperature and Sickness from Consumption in Michigan.



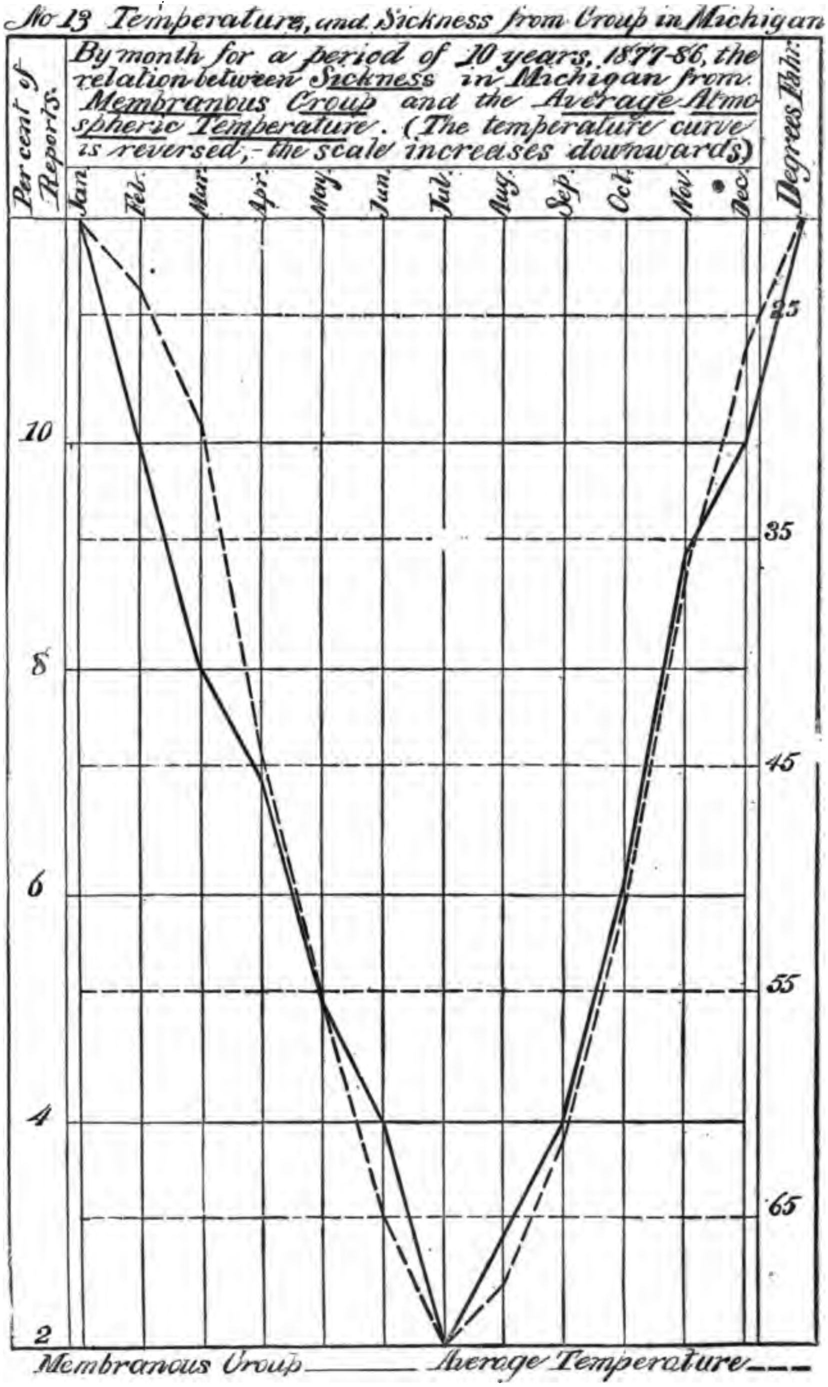
By months for a period of 9 years, 1878-86, the relation between Sickness in Michigan fro Consumption and the Average Atmospheric Temperature. (The temperature curve is reversed,- the scale increases downwards.)

No 12.—Temperature and Deaths from Bronchitis in London.


By months for a period of 30 years, 1845–74, the relation of Average Deaths per week, in London, England, from Bronchitis, to the Average Atmospheric Temperature (The temperature curve is reversed,—the scale increases downwards)

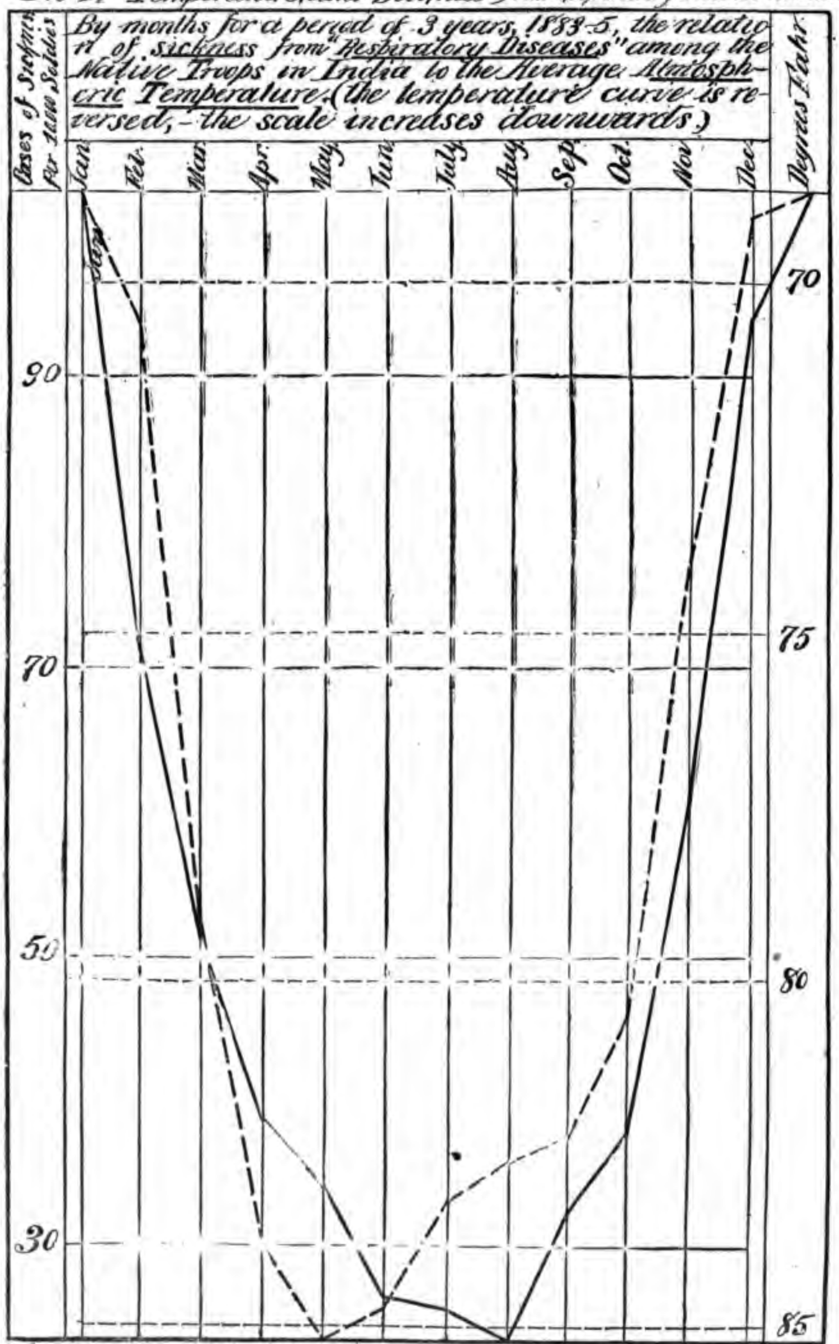
About 176,000 deaths from Bronchitis are represented in this diagram data for which are from Jour of Scottish Med. Soc. New Series Nos. XLIII., XLIV., XLV., XLVI. pages 253 and 263

No 13 Temperature, and Sickness from Croup in Michigan.



By month for a period of 10 years, 1877-86, the relation between Sickness in Michigan from Membranous Croup and the Average Atmospheric Temperature. (The temperature curve is reversed,—the scale increases downwards)

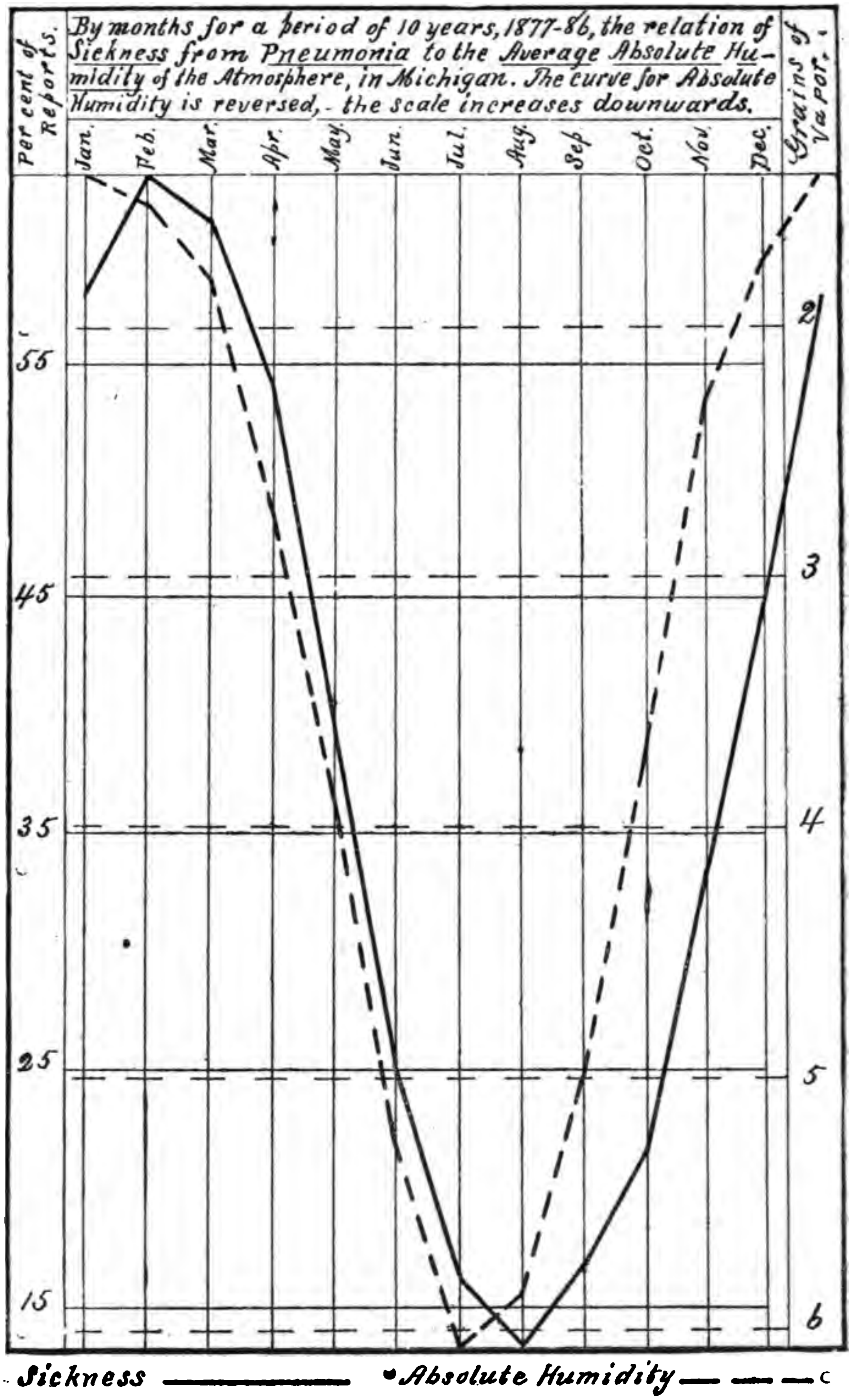
No 14 Temperature and Sickness from "Respiratory Diseases" in India



By months for a period of 3 years, 1883-5, the relation of sickness from "Respiratory Diseases" among the Native Troops in India to the Average Atmospheric Temperature. (the temperature curve is reversed, - the scale increases downwards.)

Averag cases of sickness ——— Average Temperature - - - - -
Prepared from data found in 20th, 21st, and 22nd Annual Reports of the Sanitary Commissioner with the Government in India.

NO. 15.—ABSOLUTE HUMIDITY, AND SICKNESS FROM PNEUMONIA IN MICHIGAN.



TEMPERATURE, AND SICKNESS FROM INFLUENZA IN MICHIGAN.

TABLE 1.—*Exhibiting, by months, for the ten years, 1877-1886, the average percentage of reports stating the presence of sickness from Influenza in Michigan, also the average atmospheric temperature at stations in Michigan for the same period of time.*

Ten years, 1877-1886.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average percentage of reports of sickness..........	55	61	59	52	38	28	20	21	29	33	41	48
Av. temperature, deg. F...	20.56	23.62	29.80	44.33	56.08	65.10	70.52	68.14	61.67	50.83	36.04	26.60

Table 1 is graphically represented in Diagram 1.

TEMPERATURE, AND SICKNESS FROM TONSILITIS IN MICHIGAN.

TABLE 2—*Exhibiting, by months, for the eight years, 1879-1886, the average percentage of reports stating the presence of sickness from Tonsilitis in Michigan, also the average atmospheric temperature at stations in Michigan, for the same period of time.*

Eight years, 1879-1886.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average percentage of reports of sickness..........	60	61	60	53	47	42	33	32	37	45	55	60
Av. Temperature, deg. F...	19.91	21.77	28.82	43.04	55.98	64.79	69.78	66.25	61.11	50.68	35.56	25.82

Table 2 is graphically represented in Diagram 2.

TEMPERATURE, AND SICKNESS FROM BRONCHITIS IN MICHIGAN.

TABLE 3.—*Exhibiting, by months, for the nine years, 1877-1885, the average percentage of reports stating the presence of sickness from Bronchitis in Michigan, also the average atmospheric temperature at stations in Michigan, for the same period of time.*

Nine years, 1877-1885.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average percentage of reports of sickness	77	78	77	72	61	54	43	41	49	55	67	72
Av. temperature, deg. F..	20.77	23.89	29.76	44.14	56.23	65.30	70.73	68.23	61.73	50.72	36.23	27.28

Table 3 is graphically represented in Diagram 3.

TEMPERATURE, AND SICKNESS FROM PNEUMONIA IN MICHIGAN.

TABLE 4.—*Exhibiting, by months, for the eight years, 1877-1884, the average percentage of reports stating the presence of sickness from Pneumonia in Michigan, also the average atmospheric temperature at stations in Michigan, for the same period of time.*

Eight years, 1877-1884.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average percentage of reports of sickness..........	62	66	62	56	42	27	17	14	18	23	36	48
Av. temperature, deg. F...	21.43	25.60	31.04	44.48	56.60	65.54	70.68	68.85	62.05	51.34	35.99	27.25

Table 4 is graphically represented in Diagram 4.

TEMPERATURE, AND SICKNESS FROM PNEUMONIA IN THE U. S. ARMIES.

TABLE 5.—*Exhibiting, by months, for a period of three years, 1862-1864, the sickness from Pneumonia in the U. S. Armies, also the average atmospheric temperature for the same period of time.*

Three years, 1862-1864.	Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average number of cases of sickness from Pneumonia, per 10,000 soldiers	427	447	415	324	176	107	85	74	77	139	233	281
Av. temperature, deg. F..	36	38	45	54	66	74	78	76	69	56	46	38

Table 5 is graphically represented in Diagram 5.

TEMPERATURE, AND DEATHS FROM PNEUMONIA IN LONDON, ENGLAND.

TABLE 6.—*Exhibiting, by months, for the thirty years, 1845-1874, the average number of deaths from Pneumonia in London, England, also the average atmospheric temperature for the same period of time.*

Thirty years, 1845-1874.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average deaths per week. from Pneumonia........	98	86	91	82	67	53	42	37	43	66	98	108
Av. temperature, deg. F...	38.6	40.1	42.2	48.6	52.7	60.0	64.2	63.5	59.1	52.2	44.2	40.5

Table 6 is graphically represented in Diagram 6.

RANGE OF ATMOSPHERIC PRESSURE, AND SICKNESS FROM PNEUMONIA IN MICHIGAN.

TABLE 7.—*Exhibiting by months, for the four years, 1882-1885, the average percentage of reports stating the presence of sickness from Pneumonia in Michigan; also the average daily range of atmospheric pressure for the same period of time.*

Four years, 1882-85.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average percentage of reports of sickness..........	55	58	57	51	37	25	15	12	16	22	30	39
Average daily range of atmospheric pressure.......	.325	.294	.298	.208	.171	.150	.125	.136	.156	.203	.228	.272

Table 7 is graphically represented in Diagram 7.

TEMPERATURE, AND SICKNESS FROM SCARLET FEVER IN MICHIGAN.

TABLE 8.—*Exhibiting, by months, for a period of ten years, 1877-1886, the relation which the sickness in Michigan from Scarlet Fever sustained to the atmospheric temperature: Exhibiting the average atmospheric temperature, and what percentage of all weekly reports received stated that Scarlet Fever was under observation of the physicians who made the reports. (Over 41,000 weekly reports of sickness, and over 190,000 observations of the atmospheric temperature are represented in this table.)*

Ten years, 1877-86.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. percentage of reports	22.3	23.5	23.9	21.6	19.6	17.0	13.7	11.8	12.5	16.0	17.3	18.1
Av. temperature, deg. F...	20.56	23.62	29.80	44.33	56.08	65.10	70.52	68.14	61.67	50.83	36.04	26.60

Table 8 is graphically represented in Diagram 8.

TEMPERATURE, AND DEATHS FROM SMALL-POX IN LONDON, ENGLAND.

TABLE 9.—*Exhibiting, by months, for thirty years, 1845-1874, the relation between the weekly average number of deaths from Small-pox, and the average atmospheric temperature, in London, England. Records of 30,000 deaths are included in this table.*

Thirty Years, 1845-1874.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. weekly No. of deaths.	23.00	24.00	21.60	23.75	24.50	22.40	18.00	14.25	13.00	13.00	14.50	18.20
Av. temperature, degrees Fahr......................	38.6	40.1	42.2	48.6	52.7	60.0	64.2	63.5	59.1	52.2	44.2	40.5

Table 9 is graphically represented in Diagram 9.

TEMPERATURE, AND DEATHS FROM PHTHISIS IN LONDON, ENGLAND.

TABLE 10.—*Exhibiting, by months, for a period of thirty years, 1845-1874, the relation of average deaths per week, in London, England, from Phthisis, to the average atmospheric temperature for the same period of time.*

Thirty Years, 1845-1874.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. deaths per week from Phthisis	154	153.25	160.2	162	157.25	150	144.75	136.50	132.4	135.75	146	147
Av. temperature, degrees Fahr......................	38.6	40.1	42 2	48.6	52.7	60.0	64.2	63.5	59.1	52.2	44.2	40.5

Table 10 is graphically represented in Diagram 10.

TEMPERATURE, AND SICKNESS FROM CONSUMPTION IN MICHIGAN.

TABLE 11.—*Exhibiting, by months, for a period of nine years, 1878-1886, the relation between sickness in Michigan from Consumption, and the average atmospheric temperature for the same period of time.*

Nine Years, 1878-86.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. percentage of reports of sickness..................	65	68	69	70	67	65	63	61	62	64	64	63
Av. temperature, degrees Fahr......................	20.72	22.68	30.23	44.06	55.84	64.83	70.27	67.88	61.43	35.87	35.87	25.47

Table 11 is graphically represented in Diagram 11.

TEMPERATURE, AND DEATHS FROM BRONCHITIS IN LONDON.

TABLE 12.—*Exhibiting, by months, for a period of thirty years, 1845-1874, the relation of average deaths per week in London, England, from Bronchitis, to the average atmospheric temperature for the same period of time.*

Thirty Years, 1845-74.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	ec.
Av. deaths per week from Bronchitis...........	193.5	172.5	165.	127.5	90.0	63.2	48.25	41.0	48.2	76.5	141.25	190.2
Av. temperature, degrees Fahr........................	38.6	40.1	42.2	48.6	52.7	60.0	64.2	63.5	59.1	52.2	44.2	40.5

Table 12 is graphically represented in Diagram 12.

TEMPERATURE, AND SICKNESS FROM CROUP IN MICHIGAN.

TABLE 13.—*Exhibiting, by months, for a period of ten years, 1877-86, the relation between sickness in Michigan from Membranous Croup, and the average atmospheric temperature for the same period of time.*

Ten Years, 1877-86.	Jan.	eb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. percentage of reports of sickness..................	2	10	8	7	5	4	2	3	4	6	9	10
Av. temperature, degrees Fahr........................	20.56	23.62	29.80	44.33	56.08	65.10	70.52	68.14	61.67	50.83	36.04	26.60

Table 13 is graphically represented in Diagram 13.

TEMPERATURE, AND SICKNESS FROM "RESPIRATORY DISEASES" IN INDIA.

TABLE 14.—*Exhibiting, by months, for a period of three years, 1883-5, the relation of sickness from "Respiratory Diseases," among the native troops in India to the average atmospheric temperature for the same period of time.*

Three Years, 1883-5.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. cases of sickness per 10,000 soldiers............	102.8	71.6	51.8	38.6	33.8	26.6	25.5	23.7	31.8	37.7	59.9	93.8
Av. temperature, degrees Fahr........................	68.7	70.6	79.1	83.9	85.2	84.8	83.3	82.7	82.3	80.5	74.2	69.1

Table 14 is graphically represented in Diagram 14.

ABSOLUTE ATMOSPHERIC HUMIDITY, AND SICKNESS FROM PNEUMONIA IN MICHIGAN.

TABLE 15.—*Exhibiting, by months, for a period of ten years, 1877-86, the relation of sickness in Michigan from Pneumonia, to the average absolute humidity.*

Ten Years, 1877-86.	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Sickness from Pneumonia..................	36.5	57.9	63.1	61.1	53.9	39.3	25.1	16.1	13.3	16.7	21.3	33.4	44.8
Average Absolute Humidity...........	3.44	1.38	1.51	1.81	2.75	3.91	5.27	6.07	5.84	4.98	3.71	2.30	1.73

The two lines in Table 15 are graphically represented in Diagram No. 15. This table and the diagram were not published, with this paper, in the Trans. of the International Congress, but have been added to it here in order to show how closely the inflammation of the lungs follows the rise and fall of the atmospheric humidity,—the greater the humidity the less the sickness, being the rule.

REPORT RELATIVE TO AN ALLEGED NUISANCE.

REPORT OF A COMMITTEE TO INVESTIGATE THE LOCATION OF SLAUGHTER HOUSES NEAR THE STATE HOUSE OF CORRECTION, AT IONIA.

Acting upon the request of the Hon. E. C. Watkins, Warden of the State House of Correction at Ionia, Drs. Avery and Hazlewood, a committee from the State Board of Health, visited the State House of Correction on the 26th day of January, 1888, and made an examination of the location and condition of two slaughter houses complained of.

The facts developed by the examination appear to be these: At the head of a small stream which flows through the grounds of the prison are located two slaughter houses. Following the course of the stream, which is somewhat tortuous, the distance from the slaughter houses to the prison grounds is from three-fourths of a mile to one mile. Within the grounds a dam is made across the stream forming a small pond from which ice is taken for use in the prison and asylum. The well, fifteen to twenty feet deep, which furnishes water for the prison and asylum, is located just below the dam and only a few feet from the border of the stream. The slaughter houses are about forty rods apart and situated on either side of a highway, scarcely beyond the twenty rod limit prescribed by law. The grounds of the slaughter house farthest from the prison contain between eight and ten acres, and consist in part of a small marsh or boggy piece of ground through which the stream finds its way. The grounds of the other house contain about one and one-half to two acres located upon the bank of the stream and draining into it. Upon the larger grounds are kept from fifty to one hundred hogs, upon the smaller from twelve to twenty-five hogs. These hogs have the run of the entire grounds and are fed in troughs just outside the buildings upon the blood and cooked offal from the slaughtered animals. About six to eight head of cattle and as many sheep are killed weekly at the larger house and about three to four head of cattle and as many sheep at the smaller. At the time of the committee's visit these houses were neat and clean, with no perceptible odor except that from cooking offal. The stream and marshy ground furnished wallowing places for the hogs, and the wash from the feeding grounds is either taken up by the soil or runs directly into the marshy ground and stream. These slaughter houses are located on a broken and wooded tract of land and there are no dwellings within eighty rods of them. Several farmers living nearest the locality, met the committee at the time of their visit and represented that they were almost constantly annoyed by a stench from the slaughter houses during the warm weather, and that their cattle refused to drink from the stream, and would stand all day bellowing and snuffing the air in the direction of these slaughter houses and did not thrive as they did before these houses were located here. Another farmer, the Hon. S. A. Yeomans, who lives a half mile east of these houses, writes the chairman of the committee: "That I own the land next below these slaughter houses and use it for pasture and experience no difficulty from it."

The committee requested Warden Watkins to send Prof. V. C. Vaughan, of Ann Arbor, a sample of water from the ice cut from the pond on the prison grounds for analysis. Dr. Vaughan acknowledged the receipt of the water but has not yet furnished the committee the result of his analysis. In the absence of this analysis the committee can only express the opinion:

First, That the location of the slaughter houses on the head waters of the stream and the drainage of their surrounding grounds into it, would be likely to render the ice cut from the pond on the prison grounds unfit for other use than cooling purposes, and possibly might endanger the water-supply for the prison.

Secondly, If the slaughter houses and their surroundings are kept in as good condition during warm weather as at the time of the committee's visit, they can hardly be regarded as a serious nuisance to persons living eighty rods from them.

The report of the analysis, since received from Dr. Vaughan, is as follows:

Analysis of ice water from the pond near State House of Correction, Ionia.[*] *By Prof. V. C. Vaughan, M. D., Ph. D.*

	Parts per Million.	Grains per Gallon.
Total solids	77.00	4.49
Chlorine	21.2	1.24
Nitrites	none	....
Nitrates	none	....
Free ammonia	0.04	0.0023
Albuminoid ammonia	0.40	0.023
Hardness	....	3.5°

Of this analysis Dr. Vaughan says: "The large amounts of chlorine and albuminoid ammonia show the water to be bad. There should not be more than 0.15 parts per million of albuminoid ammonia, and this water contains 0.40 parts."

Respectfully submitted,

JNO. AVERY,
ARTHUR HAZLEWOOD,
Committee.

---

[*] Sample sent by John Avery, M. D.

EXAMINATION OF PLANS FOR STATE PUBLIC BUILDINGS.

Act No. 206, Laws of 1881, (§418 of Howell's Annotated Statutes) is as follows:

Plans for buildings, to whom submitted.

> SEC. 7. That before the Board of any charitable, penal or reformatory institution shall determine on the plan of any building for school purposes, living rooms, work rooms, or sleeping rooms for inmates, or on any system of sewerage, ventilation, or heating, which have been authorized by the Legislature to be constructed, such plans shall be submitted to the Board of Corrections and Charities and the State Board of Health for examination and opinion thereon; and the Board so submitting such plans shall in its biennial report show to what extent they were approved by the Boards so examining them. That it shall be the duty of said State Boards to visit said penal, charitable and reformatory institutions when necessary to make the examinations herein required, and their official expenses necessarily incurred shall be audited by the Board of State Auditors and paid from the general fund.—§418.

In accordance with this Act, the following is a report concerning plans submitted to the State Board of Health for examination during the fiscal year 1888:—

PLANS FOR A COTTAGE AT THE NORTHERN ASYLUM FOR THE INSANE.

At the meeting of the State Board of Health, held April 10, 1888, Dr. James D. Munson, Superintendent of the Northern Michigan Asylum for the Insane, appeared before the Board and explained the plans for a proposed cottage at that institution. Dr. Munson had previously written a letter explaining the plans, which letter was also read at the meeting of the Board. The plans were carefully examined and highly commended, and Dr. Kellogg was requested to draft a resolution or statement containing the suggestions and recommendations which had been brought out in the course of the examination. The letter from Dr. Munson explaining the plans, and the report by Dr. J. H. Kellogg are as follows:—

EXPLANATORY LETTER FROM JAMES D. MUNSON, M. D., SUPERINTENDENT OF THE NORTHERN MICHIGAN ASYLUM FOR THE INSANE.

NORTHERN MICHIGAN ASYLUM,
Traverse City, Mich., April 7, 1888.

Dr. Henry B. Baker, Sec'y, State Board of Health:

DEAR DOCTOR:—With the plans I would respectfully present to your Board the following description of the principal features of the cottage proposed in connection with this institution.

The building will be a plain and substantial structure of brick and stone; a basement, two stories and an attic in height, and will be subdivided as follows: The ground floor will contain a kitchen, dining-room, store-room, boot or coat-room, coil chamber or plunum, hall, and boiler-room; first story wil contain hall, sitting-room, two dormitories, attendants' room, clothing room, lavatory and bath room, and water-closet. The hall will contain stairways to the basement and the floors above it, and second story will contain four dormitories, a water-closet, and an attendants' room.

The foundation walls will be of stone, and the superstructure of brick. The outside walls will be laid with an air space, and the partition walls will be of sufficient thickness to give due strength to the building, and to contain the ventilating and hot-air flues.

The site of the cottage will be about 700 feet south and west of the asylum and in dry, sandy soil. It will afford a pleasant outlook and be sufficiently elevated to allow of connection with the asylum sewer. The sewerage of the cottage, from sewer head or grease trap (shown on plans) to asylum sewer, will be through a six inch crock pipe, joints laid water tight. From sewer head to cottage the sewer will be of six inch cast iron pipe. The sewer head or grease trap "is simply a large brick trap with a cast iron cover, arranged for interrupting any solid matter which, by inadvertence, or design of patients, may be thrown into the sewer through the water closets," and also to intercept grease from the kitchen sink. and allow of the removal of any obstructive materials. It will be observed from the plans that, with the exception of wood-shed, the sewer does not pass under or into the building, but ends at pipe shaft; and there it is ventilated through the pipe shaft by a six inch iron soil pipe to the open air above the roof.

The plumbing will be similar in fittings to that now in use here, i. e., trap ventilation with large ventilating pipes. Waste pipes from bath tubs, wash bowls, stools, urinals, sinks, etc., will be trapped as near the fixture as possible, and each trap will be independently ventilated, and the ventilating branch will be of the same size as the waste pipe. The hoods of urinals will also be independently ventilated. All ventilating pipes from traps, etc., will pass upward as directly as possible to the open air.

Hot water will be furnished from a special heater in boiler room.

The cottage will be warmed by a low pressure steam heating apparatus, and, with the exception of the bath room and boot room, by indirect radiation. The Gold pin radiator will be used. The location of radiators, and also that of outgoing and returning steam pipes, are shown in detail in the plans. In the bath room a direct radiator will be used, and in the boot room a *self-ventilating** direct radiator is shown.

The fresh air inlets will open into the coil chambers from the north, west and east sides of the building. This will insure a full supply of fresh air independently of the direction of the wind. These inlets will have an aggregate sectional area of about 17 square feet. In ratio this will be greater than that in the best ventilated sections of the asylum. The air introduced through these inlets will be heated by passing over radiators, and will be distributed to the

Dining room by 4 flues	8x12
Sitting " " "	8x12
Hall, first floor, by 4 flues	8x12
South dormitory, first floor, by 2 flues	8x12
East " " " " "	8x12
Attendants' room, first floor, 1 flue	8x12
North dormitory, second floor, by 4 flues	8x12
East " " " " 2 "	8x12
South " " " " 2 "	8x12
West " " " " 2 "	8x12
Attendants' room " " " 1 "	8x12

---

* "Direct-indirect." H. B. B.

The total number of flues will be 32, and the sectional area of same will be 21½ square feet.

In addition to this heating apparatus there will be a grate in the sitting room. All flues for warm air will commence immediately over the radiators in coil chambers, and will end in the various rooms, seven feet above the floors.

The ventilating flues, 37 in number, will commence just above the floors, and will be carried, smoothly finished, to the top of the walls, whence they will be continued to outlet in roof by means of sheet iron pipes of the same sectional area. All the dormitory flues will be eight by twelve inches in size. The remainder, with the exception of those in the kitchen, will be 8x12 inches in size. The kitchen flues will be 12x12 inches in size. The number of foul-air outlets through the roof will be eight, each of which will be surrounded by a dome or cupola. The foul-air ducts of water-closets lead directly to open air, and likewise those from kitchen. The total sectional area of the ventilating flues will 23 square feet. All flues, whether for heating or for ventilating purposes, will be built in the inside walls.

A most difficult question to determine was the ratio of radiating surface required to heat the building. It was placed at about one square foot of radiating surface to 60 cubic feet of space to be warmed. Reckoned in this way, 1,500 square feet of radiating surface will be required to maintain a temperature of 70 degrees in cottage during coldest weather.

The capacity of the cottage will be 98,700 cubic feet or 1,974 cubic feet to each of 50 persons. Authorities place the amount of fresh air required for an adult at from 30 to 60 cubic feet per minute. Assuming 40 cubic feet as a fair average, the air in cottage will need to be changed once in 49 minutes to keep it pure.

As has been stated the aggregate sectional area of the hot-air flues is about 22 square feet. Warm air at a temperature of from 80 to 100 degrees has a velocity of, we will say, four feet per second through a brick flue one foot square. Multiply 22 by 4 and we find that we can supply 88 cubic feet of warm air per second, or 316,800 cubic feet per hour. This will afford a complete renewal of air in the building once in 20 minutes.

The aggregate sectional area of the ventilating flues, as may be determined by the plans, is about 23 square feet. Taking Dr. Lincoln's estimate of two cubic feet per second for an ordinary brick flue one foot square as an average, there will be 46 cubic feet of out-going air per second, or 165,600 per hour; and there will be a complete change of air in the cottage once in 49 minutes with 35,540 cubic feet to spare.

The question arises in my mind if this excess may not be too great, as the unnecessary removal of warm air from a building is a waste of fuel.

The cottage will be supplied with water from the asylum well through a four inch cast iron main; and it will be lighted by electricity from the plant now in use.

Washing will be done at the main building.

The cottage is designed for 50 patients. These patients will be of a quiet, industrious class, and such as will be able to work in the open air. This will enable the asylum management to vacate the cottage for a longer or shorter period every day, which will afford an opportunity to air it by means of open doors and windows, if it should be found necessary.

All side walls will be plastered on the brick; all ceilings on lath. The floors will be laid double, with a deafening coat of mortar between the furring.

Such is a hasty presentation of the points that have presented themselves to me in connection with the plans, but if I can add anything further, will be glad to do so at your suggestion.

Yours very respectfully,
JAMES D. MUNSON,
Medical Superintendent.

Lansing, Michigan.

EXAMINATION OF PLANS FOR A NEW COTTAGE AT THE NORTHERN ASYLUM FOR THE INSANE, APRIL 10, 1888, BY THE STATE BOARD OF HEALTH.

REPORT BY J. H. KELLOGG, M. D.

In general the plans show an unusual appreciation of the requirements of sanitary principles relating to the construction of hospital buildings, and an evident purpose on the part of the designer to make them embody every sanitary advantage possible. In a few points, however, there seems to be room for improvement, particularly as regards ventilation.

Fresh-air Inlets. 1. The area of fresh-air inlets is ample providing the occupants of the house were at all times equally distributed through it; but an error is made in calculating the entire fresh-air supply as being available at all times, since the patients will all occupy different portions of the house at different times. During meals they will occupy the dining-room; at other times the sitting-room, and at night the sleeping-rooms. It is thus evident that the area of fresh-air inlets, as calculated, is much too small. The air supply to the dining-room and sitting-room should be doubled at least, and the air supply to the sleeping apartments should be proportionately increased. This may be done by so arranging the indirect heaters and warm-air ducts as to allow of their being used for the dining or sitting rooms, when these rooms are occupied, and shut off from these rooms and made to supply the dormitories during the night. This plan would, however, require the careful supervision by some competent person; and if the necessary regulations were neglected, it would result in an insufficient supply of air, and on this account would be a measure of doubtful propriety, although economical as regards first cost.

2. The registers controlling the fresh-air ducts should be so arranged that when warm air is shut off, cool air will be turned on. As ordinarily arranged, the closing of the register shuts off the air supply altogether. By proper arrangements the warm air may be tempered by the admixture of cold air so as to secure the proper degree of heat without shutting off the air supply. A method of accomplishing this at small expense was suggested to Dr. James D. Munson, Superintendent.

3. It is the general experience that self-ventilating registers are not a practical success. Unless steam is kept on all the time the returns or coils are likely to freeze. Under the influence of adverse winds the air supply may be entirely cut off, and under some circumstances the opening intended to be an inlet may become an outlet, thus not only robbing the room of its fresh-air supply but drawing into it foul air from other rooms, and also causing a waste of heat.

Foul-air Openings. 1. The area of foul-air registers, ducts and shafts should be increased so as to be proportioned to the fresh-air supply when increased as above specified. The sectional area of ducts and shafts should be at least one-half greater than the fresh-air registers and ducts.

2. Foul-air openings should be placed under windows, or at least in the outside walls, so as to remove from the room the coldest air and thus secure a rapid and equable circulation. The foul-air shafts should be in the inside walls. The foul air may be conveniently carried from the register openings to the foul-air shafts by utilizing the space between the joists.

3. The foul-air registers in the kitchen should be placed at or near the ceiling. The plan of carrying the foul air from each room separately and directly as possible to the roof, is especially to be commended. When several ducts are gathered together and discharged through one large opening, the separate ducts should be extended up into the opening as far as possible so as to obviate the danger from down drafts of foul air.

4. The foul-air openings in water closets should be underneath the seats or urinals, or both.

5. It is recommended that the bath room have a foul-air outlet, and that the clothes room have a fresh-air inlet.

EXAMINATION OF PLANS FOR NEW BUILDINGS AT STATE SCHOOL FOR GIRLS AT ADRIAN.

An invitation having been received to examine the plans for a new building, its proposed site, etc., at the State School for Girls at Adrian, a special meeting of the State Board of Health was called for that purpose to be held in Adrian, Aug. 11, 1887. At this meeting only Drs. Kellogg and Baker were in attendance. The architect had previously supplied the following outline of the plan of heating, ventilation and house drainage:

ADRIAN, Aug. 5, 1887.

DESCRIPTION OF THE HEATING, VENTILATION, ETC., AT THE PROPOSED NEW COTTAGE FOR THE INDUSTRIAL HOME FOR GIRLS AT ADRIAN, MICH.

The plan of the new cottage is very similar to the others as regards the two wings. The front part is entirely different, being just 37x40 feet on the outside, three stories high, containing each three rooms and main hall on first and second floors, and eight rooms for girls on third.

The heating is intended to be done mostly by indirect radiation,—three large registers, 26x36, in the corridors and halls on second floor to heat all the small rooms. This is the same plan that has been used so far in the other cottages, and gives good satisfaction. There are also indirect radiators for the officers' sleeping rooms and for the girls' parlor. The rest is by direct heating. The steam supply is to be furnished by the same general system that supplies the others.

The plan of ventilating the cottage is this: Two large ventilating shafts will be built, one about in the center of each of the wings, each having an area of from seven to eight square feet. These will be heated by steam coils being placed in the basement directly into the shaft. There will be flues built into the outside walls, starting below the first floor and extending to one foot above the second floor level,—one of these flues for each of the rooms on second floor. They will have openings close to the floor, covered by register face plates. In the basement will be a sufficiently large, horizontal air-duct, built of matched lumber, hung to the joists, to run each way, lengthwise through the building, and connected with the shafts. The space between joists will be utilized to bring the air from the vertical flues each way to the central horizontal duct. The corridors and hall will have large openings directly into shafts.

The house sewage is intended to be carried and connected with the main sewer that serves the others. All plumbing fixtures will be properly trapped and ventilated, and the water-supply will come from the pumps and tanks of the institution.

The above is probably sufficient to give such an idea that your honorable body will be able to decide as to the practicability of the arrangement.

Respectfully yours,
C. F. MATTHES,
Architect.

A copy of the above letter had been forwarded to each member of the Board before the examination by Drs. Kellogg and Baker. Members of the Board criticised the plan of having the foul-air ducts from several rooms lead into a common duct for foul air, from which one shaft on either side of the building led up to the outer air. A few suggestions for the improvement of the plans were offered, and very kindly received.

August 22, the architect sent another outline of the plans for ventilation and warming, modified somewhat in accordance with the suggestions made to him, and in the opinion of the Board much improved. A copy of this second communication is as follows:

ADRIAN, Aug. 22, 1887.

Dr. H. B. Baker:

DEAR SIR,—Enclosed you will find a copy of the specifications on ventilation, as I have them written up, for the new cottage at the Industrial Home, also a description of the amount of radiation and the principal points on plumbing as I have them planned. To give you an idea in about what proportions I made my calculations, I will take one room, say the girls' dining room on first floor: This room is 18-6x32-6 and 10-6 high. It has five windows on south side, that side of room exposed. I have allowed for that room 210 feet of indirect radiation, with an air supply of 4 square feet and 24x32 register. The ventilating registers are under the windows, 4-10x14 registers connecting with a horizontal duct of 4 square feet capacity into a separate vertical flue in main shaft. This is about the way the whole is figured, allowing 1 foot of radiation to from 30 to 50 feet of space, according to exposure of rooms and for what they are used. Please let me know what you think of it now and oblige

Yours,
C. T. MATTHES, *Arch.*,
No. 41 Toledo St., Adrian, Mich.

VENTILATION.

The system of ventilation employed is this: The foul and cold air will be taken out of the rooms, close to the floor, by means of registers placed in the base (where shown in plans), on the outside walls wherever possible. These registers connect with flues built into brick work to conduct the air to the space between the joists. There it is taken either to a center partition up which it goes to the attic floor, and there connects with ventilator or to a large air duct, communicating with shaft, as for sewing room and girls' dining room, or to connect directly with a flue going to the roof, as in kitchen and laundry. Each room will have a distinct and separate flue to the open air.

The system of heating employed is all indirect with exception of lower halls, manager's room and lavatories. (Steam specifications call in all for about 2,000 feet of radiation, with ample fresh air supplies. Amount of space to be heated is about 90,000 cubic feet).

All the spaces between the joists and between studding serving as flues will be covered with asbestos paper on both sides of joists and studs. At the bottom of joist in basement put on paper first, then cover the space with dry matched lumber. At the top the floor will form cover. On studs lath and plaster over the paper. The sides of joist and studs in flues to be whitewashed. Foul air ducts in cellar to be made with 1½ plank for sides and dry matched lumber for bottom and top, all to be airtight and whitewashed inside. The foul-air shaft in dining room and kitchen to be made same as hot-air shaft. The whole to be lined on the inside with No. 26 sheet iron, using the same iron for making the divisions as shown. Those going through to attic will there be connected with the various ventilators with 7 sheet iron pipe No. 26. Furnish and secure to base all the various register plates of the sizes shown on plans. Those for girls' sleeping rooms are all 5x14 inches in size. All to be a fancy pattern, black japanned faces.

Vent registers at ceilings will be arranged with cords and handles so they can be regulated from floor. (This refers to ceiling register in kitchen and laundry). All ventilator tops are made of galvanized iron, with iron partitions to separate flues as shown.

The plumber's specifications call for all soil pipe stacks to run up and out through high point in roof, each fixture to be ventilated from trap of same to a separate vent stack.

The subject was considered at the special meeting of the Board held in Traverse City Aug. 27, and Drs. Kellogg and Baker were conditionally authorized to express the approval of the Board.

PLANS OF NORTHERN PRISON AT MARQUETTE.

At the regular meeting of the Board held July 12, 1888, the plans of the Northern Prison at Marquette, as prepared by Scott & Co., architects, of Detroit, were presented and carefully examined by the Board. The secretary was instructed to report upon these plans as follows:

1. That so far as shown by the drawings presented, we approve of the plans for withdrawal of foul air and for heating.
2. That we approve of the plan of introducing the fresh air through indirect radiators placed beneath the windows as proposed by the architect, provided that the combined area of the clear openings shall be equal to the combined area of foul air exit openings, as shown in the plans.
3. That in general the plans so far as received be approved, and that the architect be complimented on his plans for ventilation.

EXAMINATION OF PLANS FOR PROPOSED COTTAGES AT THE EASTERN ASYLUM FOR THE INSANE.

Dr. Henry M. Hurd, Superintendent of the Asylum for the Insane at Pontiac, Mich., presented and explained plans of two cottages proposed to be erected at that institution. One cottage is designed for fifty males, and the other for fifty females; and they are for a class of patients who need little if any restraint, and the males are able to engage in out-door employment. They are designed to give the patients those comforts of home which cannot be had by patients who need to be guarded. The lower floor is to be occupied by the housekeepers—man and wife, and for a parlor, day room and dining room for the inmates; the upper floor for dormitories for sleeping rooms. There is to be a grate in each room. Foul-air ducts from the base of each room lead up in inside walls to trunk flues in the garret, and then to chimney flues to outer air. In dormitories for ten persons the duct is 16x20 inches. Fresh air is supplied through inlets in outer walls in ducts leading underneath floor to beneath direct radiators (Stillson's), the openings to radiators being 12x12 inches, with register to lessen and control the opening. Water-closets are to be ventilated separately from the rest of the building, through ventilating flues with a "Globe" top. Water-closets are to have automatic flush tanks. The Board carefully studied the plans and made a few suggestions for changes, as follows:

The method of heating by indirect radiation was suggested.

The ventilation of the lower floor should be into ducts separate from any which ventilate the upper floor; and the same principle should apply to the water-closets on the two floors.

In the building for females, in the dining-room the foul-air outlet flue is marked 16x16 inches. It should be large enough to give five and three-fifths square feet area, say two feet by three feet, allowing for reduction by register.

It was also suggested that the foul-air outlet registers be under the windows, thus removing the cold air which falls there, and not permitting it to move across the floor and cool the feet of occupants of the room. The foul-air ducts to lead under the floor to flues on inside walls.

EXAMINATION OF PLAN FOR SEWER FROM THE STATE REFORM SCHOOL.

Hon. Wm. E. Donovan, a member of the Board of Control of the State Reform School at Lansing, presented a plan for constructing a sewer from the school buildings to the main sewerage system of Lansing, which was approved by the Board. The plan presented covered the engineering aspect of the question.

A committee consisting of Drs. Vaughan and Kellogg was appointed to visit the Reform School to examine the proposed locations of water-closets and other parts of the house drainage for the buildings, and be prepared to explain to this Board the existing conditions in connection with the house-drainage plans, when they shall be submitted.

[No such plans have been submitted.]

REPORT OF AN INVESTIGATION OF AN OUTBREAK OF TYPHOID FEVER AT THE STATE INDUSTRIAL HOME FOR GIRLS AT ADRIAN, MICH.

This is a final report on the same subject as the one presented to this Board at its meeting April 10.[*] The purpose of this report is to present more fully the facts elicited by the investigation, upon which was based the opinion that the outbreak was due to grave defects in the sewerage and ventilation of the buildings, through which the propagation of the poison was effected after its introduction. The opinion expressed by your committee that defects in sewerage and ventilation were the causes of the extension of the disease, having been strongly questioned by others who have made at least a partial study of the circumstances attending the epidemic, your committee beg to be permitted to present the following full particulars:—

---

[*] A statement of the preliminary report published in the proceedings of the meeting held April 10, 1888, is as follows: "Drs. Kellogg and Vaughan made a report concerning their investigation of the outbreak of typhoid fever at the State Industrial Home for Girls at Adrian. The outbreak was attributed to the contamination of the air supply of the buildings with sewer gas, and the infection of the sewer system by discharges from a patient sick with typhoid fever, brought there from Sault Ste. Marie. This opinion was based on the testimony of managers and housekeepers and a large number of girls, as well as the personal observation of the committee. There were found to be grave defects in the sewerage system which resulted in a pollution of the air of the whole building, endangering the lives of the inmates. This was probably increased by the stopping up by freezing of a rain-water conductor which was depended upon as a ventilator to the sewer. The water-supply was found to be good. In the sewer air, there was found by Prof. Vaughan a great abundance of bacterial growth; but after the first case the discharges of the typhoid patients had been disinfected, and no typhoid germs were found. Disinfection of the whole sewer system, and opening up of the fresh-air inlets to the buildings was at once recommmended by the committee. The outbreak stopped immediately, perhaps because of the disinfection after the first case. On motion, Dr. Kellogg and Dr. Vaughan were requested to prepare a complete report of the investigation for publication in the Annual Report of the Board."

The two members of the committee visited the institution and made examinations on different dates, Dr. Vaughan having been, by accident, prevented from reaching the place at the time appointed. Dr. Kellogg, who made the first examination, visiting the institution on February 6, 1888, reports as follows respecting circumstances which in his opinion have an important relation to the origin and extension of the outbreak:

The first case was that of a young woman from Sault Ste. Marie, who was admitted to Croswell Cottage the latter part of November, 1887. She was not well at the time of her arrival, and continued ailing until about December 14, when she became quite ill, and December 17 was evidently sick with a continued fever, which was subsequently pronounced typhoid. This patient was not free from fever until January 23. Two weeks after she was confined to bed, numerous cases of diarrhœa appeared in each of the cottages. From one-fourth to one-third of the inmates of the cottages were attacked by the disease, probably one-half of the total number being affected.

Six weeks after the first case became pronounced in character, other cases of typhoid began to make their appearance in the various cottages, which were about equally affected.

The general prevalence and equal distribution of the disease rendered evident the fact that the cause of the outbreak must be sought in some circumstance or condition affecting the several buildings of the institution in about the same degree. Specimens of milk and water were collected and subsequently examined by Dr. Vaughan, with negative results. I visited each cottage and made a careful examination of the sewerage and ventilation. The following are the main facts elicited by this examination:

Croswell Cottage.—Found basement odors abundant in the building. Standing over a register on the second floor, I observed odors strongly suggestive of the kitchen, which the matron said was due to the fact that the "pickle barrel" had been moved a day or two before, and also remarked that whenever the pickle barrel was moved similar odors were present in the house for a few days subsequently. Descending into the basement, found that the air-supply of the building was taken from the basement, which contained a considerable quantity of wood, stores of vegetables, a room used for laundry purposes, etc. The foul-air outlets of the building are placed beneath windows and connected with ducts which pass to the basement in the outside walls, and are then carried to a ventilating shaft. In cold weather the wind blows in through the foul-air registers so strong as to make it necessary to close them. I found these registers all closed up.

Inquired if bad odors had ever been observed in connection with the sewerage, but did not learn of any.

Clark's Cottage.—Found the condition of the ventilation the same in this building as in the preceding. A pan hopper was found to have a seal of only one-fourth inch, owing to an insufficient supply of water for the closet. Could discover no ventilation of the closet trap. Was told that the soil-pipe continued upward through the roof.

Honor Cottage.—Found a pan closet with no seal and no ventilation pipe. In the basement, from which the entire air-supply of the building was obtained through indirect heaters, there were piles of coal and wood, clothes-drying room, laundry, soap-barrel, etc. The air-boxes leading to the indirects were tightly closed, so that the entire air supply of the building was exposed to a considerable degree of contamination. Found in the kitchen an unused slop-hopper, from which a very bad odor emanated. The seal was not broken, but the water in the trap was black and very foul smelling.

Gillespie Cottage.—The conditions in this building were not essentially different from those in the buildings already described, although the ventilation was somewhat better than in others. All the air was taken from the basement, but the basement received a small supply of fresh air through an opening in a window, except when the window was closed. On making inquiries respecting sewerage, the housekeeper complained of very bad odors from the slop-hopper and sink. She had observed them occasionally during the two years of her stay in the building. Observed that the odors were especially bad the last week and the week previous. On making a more particular examination found the slop-hopper was trapped, but the trap was not ventilated, and that a second trap placed outside the building was so arranged as to occasion an imprisonment of gas between the two traps. This confined space was supposed to be ventilated by a rainwater leader, which at best is a very poor ventilator for this purpose, being liable to down drafts occasioned by currents of water during heavy rains, or a complete stoppage through the accumulation of ice in cold weather. On examining the leader outside the building, I observed heavy icicles hanging from the joints of the pipe near the ground, which led to the belief that the pipe was filled with ice, in which opinion the engineer, who was with me at the time, fully concurred. I was told by the engineer that a similar arrangement existed in connection with all the cottages. The unventilated portion of the sewer pipe was connected with a row of laundry tubs in the basement.

Central Cottage.—Mrs. Curtis, the laundress of Central Cottage, has observed bad odors for three or four months; has noticed that the odor is worse when water is poured into the tubs, and especially when it is poured into the kitchen sinks in floor above. On one occasion the pressure of gas was so great as to blow the stoppers out of the tub. This was evidently due to obstruction of the leader, and the pressure of the column of water from the kitchen sinks in the story above. Mrs. Curtis stated that the girls had always complained of foul odors in the laundry. Miss Honorton, the kitchen matron, stated that when she came two years ago she was told that the sinks in the kitchen had always smelled bad.

From the mention of complaints by the girls, it occurred to me, as the girls in their work came in closer contact with the sewer openings, that it might be well to prosecute an inquiry among the inmates of the various cottages, which, through the courtesy of the matrons in charge, I was enabled to do. I was especially anxious to do this as, with the exception of Central Cottage, I had been unable to obtain from the managers of any of the cottages any evidence indicating air-contamination from the sewers. On visiting several cottages I obtained the following information.

Croswell Cottage.—The manager on being closely questioned stated that she had recently noticed an odor in the girls' bath room. Six of the girls had observed bad odors. Myrtie had observed a very bad odor when working at a laundry tub about two weeks ago. Anna observed bad odors at the kitchen slop-hopper on Wednesday or Thursday of the previous week. Ann J. and Eva were working at a tub to-day which "smelled real bad," but only when the water was running, and Ida noticed a bad odor at the kitchen slop-hopper last week Thursday. Nettie observed the same on Friday last. Ann J. said she called Mrs. Powell's attention to a foul smell in the basement near the soil pipe one day last week. On speaking to Mrs. Powell in reference to the matter, she remembered the circumstance, and took me to the spot where the foul odor had been observed by herself as well as the girl, but I was unable at the time to detect any evidence of the escape of sewer gas.

Clark Cottage.—Florence, an inmate, worked in the kitchen during December and January; noticed bad odors at the sink and hopper, especially when water was poured in. Sometimes the odor was so bad as to produce nausea. Gussie had noticed bad odors at the kitchen slop-hopper and was also nauseated. The matron of the kitchen and laundry stated that she had observed odors of sewer gas "once in a while a day." Noticed bad odors particularly about ten days ago for three or four days, also three or four days ago.

Eva M. had charge of the sink for a couple of months previous to the last month. Odors had been very bad, especially during the last month of her time of service (December). The kitchen matron stated that she almost always observed "A deathly air in the halls in the morning," on first coming out of her room. Stated that she kept the transom of her room tightly closed, and ventilated the room by the window. On coming out of her room in the morning, she was often obliged to go back two or three times before she could endure the air of the halls.

Gillespie Cottage.—The housekeeper stated that she had noticed bad odors in the cottage. Nora Beers had observed bad odors coming out of the slop-hopper when pouring water in. The housekeeper also noted a break in the sewer under one of the windows outside of the house, and had called the engineer's attention to it several times. Ernestine noticed a particularly bad smell at the laundry tubs last Wednesday. The odor was so bad it sickened her so that she could not eat her breakfast. J. Brown had noticed that the end tub next to drain always smelled the worst, and was always bad. Another girl stated that she always noticed that the laundry tubs smelled worse on Friday than any other day. Upon inquiry I found that in the rotation of work it happened that she worked at the end tub on Friday of each week.

Central Cottage.—I found the girls as usual gathered in the work room, and as in the other cottages, I inquired how many had observed bad odors. A large number of girls arose to their feet. The girl who had observed bad odors were found to include all the girls who worked in the laundry, and six out of nine girls employed in the kitchen. Gertrude had noticed bad odors in the kitchen, particularly the week previous, and also the last week in December. Josephine had observed bad odors between Thanksgiving and Christmas. Catherine said she had observed a bad, sour smell in the kitchen sink ever since last summer, whenever water was poured in. Six girls had noticed bad smells in the laundry on Saturday. This included all who worked at the laundry tubs on that day. One girl had been made sick by the foul odors on that day.

On account of the lateness of the hour I was not able to visit Honor Cottage the second time, but from the previous examination I had reason to believe that the same condition would be found as at the other cottages.

The facts elicited by my investigation of the ventilation and sewerage may be briefly summed up as follows:

1. Without exaggeration it may be said that the ventilation was as bad as possible. The air supply in the case of each cottage being taken from a basement, which received little or no air from out of doors, which contained wood, vegetables, and other perishable and decaying substances, and worst of all, stationary laundry tubs connected with a sewer not ventilated except by the rain-water leaders. With the exception of Central Cottage, the foul-air registers were closed up, as they worked backward, admitting cold air. Basement odors were to be smelled in all parts of the cottages.

2. The testimony of both the officers and inmates of nearly all of the cottages agreed in pointing most emphatically to sewer gas contamination. The arrangement of the house drainage, the defective closets, the lack of ventilation of traps, and especially the defective ventilation of the sewer, supply exactly the conditions requisite for sewer-gas contamination.

3. The remarkable concurrence of the testimony of the inmates and officers of the various cottages respecting the particular times at which the worst odors had been observed, not only places the stamp of reliability upon testimony which might otherwise be questioned, but clearly shows that the entire system of sewerage connected with the five cottages is subjected to some disturbing influence which simultaneously affects all the cottages alike, exposing all to dangerous contamination with sewer gas. Precisely what this influence was I was not, during my brief stay at the institution, able to discover, but I thought the facts fully justified the recommendation that the entire system of sewerage should be thoroughly inspected at the earliest moment possible, by a competent sanitary engineer.

As stated in my previous report, I recommended a radical change respecting the air-supply and ventilation of the buildings, and the disinfection of the sewer by pouring into the sewer-openings at each cottage a barrel full of a solution of corrosive sublimate in the proportion of one part to 400 of water.

Only one case of well-marked typhoid occurred after my visit. In this case the patient was taken sick three days subsequent to my investigation and two days after the sewer had been disinfected and the fresh-air ducts opened, as per my recommendation. It is evident from this fact that whatever influence the disinfection of the sewers and the improving of the ventilation had in checking the epidemic or preventing a recurrence, some other efficient cause must have been in operation some time previous to this, as the time which elapsed was not sufficient to have produced the effects apparent, the average period of incubation of typhoid fever being about eleven days. An explanation is found in the fact that Dr. Jewett had taken the precaution to thoroughly disinfect the discharges in every case as soon as the diagnosis of typhoid fever was made out. Of course, some cases of fever had existed which had not been discovered until after the patient had really been ill for several days, and thus a large amount of typhoid material must have been conveyed to the sewers; but the great number of cases, there being several sick at one time in each cottage, had occasioned the use of so much disinfectant material that the sewers had by this means been effectually disinfected. At any rate, this seems to me a plausible view, and taking all the facts into consideration, the most probable that can be gathered from the facts concerning this outbreak of disease.

Subsequent to my first report, I received a letter from Dr. Jewett, the attending physician of the Industrial Home, giving the particulars respecting three other cases connected with the same outbreak. I quote from his letter, which is dated May 27, 1888, as follows:

"The watchman, Mr. Hagan, was taken sick about the 1st of February with febrile symptoms which his physician, Dr. Stephenson, thought to be of a typhoid character. He was sick perhaps a week, but felt badly for a month or more. His little daughter, three years of age, was taken about March 30, and died in two weeks, the physician states from typhoid fever. This man resides in the north part of the city, his duties call him inside the building, for a few moments only, several times each night, his child had never been on the grounds.

"Mr. Warrick, the gardener, was taken sick March 30, case markedly typhoid, and died April 17th; this case also treated by Dr. Stephenson.

"Mr. Warrick was scarcely inside the buildings while the epidemic was in progress or thereafter, his duties were entirely in connection with the garden, he took his meals at home, one-half mile away to the north, and slept there. His house a new one, on virgin soil, no cellar, his well absolutely pure as far as chlorides or organic matter are concerned.

"He had nothing to do with sewers or closets. The only possible cause I can perceive, he cleaned out the large reservoir about the middle of March, and though assisted by others, he was the only one sick. He was cared for assiduously by our ladies and one nurse from Detroit, and everything done that could be for him.

"You will remember in my report that all discharges and clothing were disinfected in the *first case* as well as the others, as soon as she was thought to be sick, and it was equally true of the subsequent cases that no discharges were disinfected *prior to their coming down with the fever.* You did not make it appear so in your report to the State Board, as regards the first case. The cause had evidently spent its force before your visit, as no typhoid germs were found in the specimens of sewer gas, and the last case sufficiently marked to be pronounced typhoid, was taken sick February 9, three days after your visit, and two after the disinfecting of the sewers.

"If there are 'grave defects in the sewer system' the State Board of Health should shoulder at least a portion of the blame, as the plans for the buildings were submitted to that Board and approved by them, and they had visited and inspected the institution many times, and had made no criticisms until the outbreak of the disease. [These statments are erroneous. The plans for the buildings were submitted to the State Board of Health, but not fully approved, as may be seen by referring to pages 119-120 of Report of State Board of Health for 1883. Committees of the State Board of Health have inspected the institution, but they have made criticisms. One instance is given in this article, in Prof. Vaughan's report of his examination in 1884, printed on pages 31 and 32 of the Report of the State Board of Health of 1884.—H. B. B., Sec. S. B. of H.]

'I confess I have not been able to formulate a theory as to the outbreak and propagation of the germs, that is free from a good many objections, but we are getting things in as good shape as possible, so as to avoid any repetition of the trouble in the future. We mean to have our Institution sanitarily perfect."

As regards the cases referred to in Dr. Jewett's letter, I should say that it is not at all impossible that the infection may have been received from the same source as that which gave rise to the other cases. Indeed, it seems to me most probable that this was the case. The watchman may have been especially susceptible, or may have been unwittingly exposed to air contaminated with sewer gas of a specially malignant type during his passage through the building. It is certainly a reasonable hypothesis that his child may have contracted the disease from her father.

As regards the case of Mr. Warrick, the gardener, there was evidently an ample opportunity for exposure while engaged in cleaning out the privy reservoir in March, about two weeks before he was taken sick.

In closing this statement I wish to say that so far as the care of sinks, hoppers, closets, laundry tubs, etc., connected with the buildings of the Home depended upon good housekeeping, not one word of criticism could be offered. All the cottages gave evidence of most excellent management, and were models of neatness and order. As regards the responsibility of the State Board of Health, I am not certain that all the suggestions made by the Board when the plans were submitted for examination were carried out by the builders. I believe no official inspection of this Institution has been made since its erection until the visit of your committee. I have, however, a distinct recollection that the faulty arrangement of the air supply was pointed out by myself and other members of the Board, on the occasion of a visit to the Institution some two or three years ago for the purpose of inspecting the plans for a proposed new building which has since been erected. At that time particular attention was called to the fact of the great danger of air contamination, and wholesale injury to the inmates of the cottages, as the result of taking the air supply from the basement instead of directly from out of doors. It is certainly to be hoped that the determination expressed by the attending physician that the State Industrial Home shall be made "an institution sanitarily perfect" will be fully carried out.

Dr. Vaughan says that he examined the milk, water and sewer-air sent him by Dr. Kellogg. The milk and water were found to be free from contamination and there was no evidence that the milk was adulterated. The sewer-air contained a great number and variety of germs, but among these the typhoid germ could not be recognized. He visited the school some weeks after Dr. Kellogg and can confirm all that Dr. Kellogg has said concerning the inefficiency of the ventilation and sewerage. That the State Board of Health has not wholly approved of the sanitary condition of the State Industrial School is shown by a report made by Dr. Vaughan, and printed in the Annual Report of the State Board of Corrections and Charities in 1884, in which he stated:

To the Michigan State Board of Health:

In accordance with the request of Dr. Kellogg, chairman of the committee appointed by the president of this Board to visit the Industrial Home for Girls, at Adrian, I went to Adrian September 13, but was sorely disappointed in finding that neither Dr. Kellogg nor Dr. Lyster had been able to keep the appointment. However, I thought it best for me to inspect the buildings as far as my time would permit and report my observations to this Board. In the first place I desire to state that according to my understanding of the object of this inspection, it is for your committee to speak of the sanitary conditions of the school only. In company with Dr. Logue of Adrian and Dr. Wilder, physicians to the school, I visited the new cottage, Clark cottage, Croswell cottage, and the chapel. My time did not permit me to visit the other cottages, Honor and Gillespie.

New Cottage.—In this cottage, which has just been finished and is only partially occupied at present, the only thing needing criticism, in a sanitary sense, is the construction of the so-called strong rooms in the basement and in the attic. These rooms are used for the confinement and punishment of refractory inmates. I was informed that the strong rooms in this cottage have never been used yet; but the purpose is to use them as is done in the other cottages. In these, girls are kept under lock for 24 hours and longer. The strong rooms in the basement are about 8 by 10 feet in the clear, with solid brick walls and with no provision for ventilation, light or heat. Being in the cellar through which steam pipes pass, the temperature of these rooms will probably be high enough, however. But no animal should be confined in one of these rooms for 24 hours, be that animal beast or human. The probability is that the rooms will never be used. The strong rooms in the attic have no provision for heat or ventilation, and the fact that they will be too hot in summer and too cold in winter should also prevent their ever being used as prisons.

It will be remembered that this Board, in examining the plans for this cottage, expressed earnestly its disapproval of these strong rooms on account of the entire absence of ventilation in them.

This is a handsome, well-arranged cottage, and, barring the statements already made, I found nothing deserving criticism.

Clark Cottage.—In this cottage the new arrivals are first placed. One strong room examined in the basement, and which is frequently used, is to some extent furnished with both light and air. The whole building, however, needs revision in order to establish ventilation. There is no means of removing the foul air from the large rooms save by the windows. For instance, the sewing-room, in which there are often more than 30 girls for several hours, is heated by a large steam coil, but there is no provision for the removal of the foul air, Of course, at the time of my visit, the windows were open and the air good; but this could not be the case in the winter. Everything about this cottage seemed to be kept most scrupulously clean and in perfect order.

Croswell Cottage.—In this cottage are placed the most refractory girls. The same criticism as to lack of ventilation is to be made here as in Clark cottage. The strong rooms could not be examined, as the keys could not be found by the lady in charge.

The Chapel.—During the afternoon the girls are at school in the chapel. There is provision for the admission of fresh air, but none for the exit of foul air. This deserves especial attention on account of the large number of pupils in the building.

There are now in the whole school, so Dr. Wilder informs me, about 160 girls. The capacity of each cottage is about 40, and there are five of these cottages.

While, as shown above, the sanitary conditions of the buildings are not perfect, and the ventilation might have been made adequate as well as not when the cottages were erected, still we must say that the children sent to the Reform School at Adrian have a home with better sanitary conditions than are possessed probably by a majority of the homes in Michigan. The water-closets and bath-rooms are clean and free from any disagreeable odor. We were informed that the only difficulty with the sewerage arises from lack of sufficient water sometimes for flushing purposes.

V. C. VAUGHAN.

REPORT CONCERNING AN OUTBREAK OF TYPHOID FEVER AT THE STATE PRISON, JACKSON, MICHIGAN.

BY HENRY B. BAKER, M. D., SECRETARY OF THE STATE BOARD OF HEALTH.

On request of the State Prison Inspectors, a meeting of the State Board of Health was held at the State Prison, Jackson, January 16, 1888, to investigate the cause of the outbreak of typhoid fever at that institution.

After a thorough investigation, the following statement of the evidence taken was sent to the officers of the prison, and to members of the State Board of Health, for corrections if anything was incorrectly stated. No one has suggested anything wrong in the statements, which are as follows: (Some of the remarks upon the evidence, inclosed in brackets, have been added since, from notes or observations made at the time of the examination.)

MICHIGAN STATE PRISON,
Jackson, Jan. 16, 1888.

DR. WILLIAMS, physician at the prison, says: We have had about forty cases of typhoid fever. There has been since Nov. 5 (1886?) an occasional case of typhoid fever, altogether five or six cases, but no deaths. Disinfection of stools has been done. [recently.] The general sickness has been little. The first case occurred about December 1, (1887?). About Christmas, 1887, the cases began to come down at the rate of several a day, until to-day there are about thirty-five in hospital, some of a severe type, having a dry tongue, fetid breath, diarrhea and tympanitis. There has been one death, the cause being the high temperature, and the failure of the heart. One has had hemorrhage.

The drinking water is from an artesian well, tubed twenty feet to the rock. [This statement is probably an error. See statement of Mr. Howind.] *Not tubed in* the rock, which is sandstone. The water is hard. The city is supplied with water obtained in a similar manner, probably from the same stratum.

The sewerage system is not known to any person here. It has been put in by patchwork from time to time.

Dr. Williams is in active practice outside, and visits here two times a day.

He found in the east wing a leak in the soil-pipe from the hospital.

The most typhoid has occurred in the west wing; over 75 per cent of the cases have been in that wing, where it began. [How foul gases or germs in the east wing could cause typhoid fever in the west wing, is perhaps susceptible of explanation as will be seen towards the close of this article.]

Those men work in about six shops. There are, in closets, tubs for use by the men while in the shops. Carbolate of lime is used in the tubs, which are emptied twice a day.

Have found no leak of sewer-pipe into the west wing. At the *west end* of the west wing, however, was an improper catch-basin; about 14 days ago that was remedied by putting in a trap.

The convicts in the east wing work in different shops from those in the west wing.

A careful study of the 25 per cent of the cases which have occurred among those in the east wing can be made. Of these, two cases were in the kitchen, which is adjacent to the west wing.

No one from the east wing was in the hospital when the outbreak began. The cases in the east wing occurred later than those in the west wing. There is grating and air connection between the two wings. The current might be from either wing to the other, except for the size of the ventilator shaft. There is a ventilating shaft at the west end of the west wing. The opening is 21+29 in. (see Mr. Howind's statement). The shaft is 16 square feet in area. No difference in the air of the two wings was noticed. There had been no complaint, but on questioning, men have said that they got some odor in the west wing. There are four tiers of cells, one above another. No cases have come from the base tier of cells. Men in the west wing are slightly younger than those in the east wing.

Nearly all the old men are in the east wing, and the weaklings are there. There are 320 cells in each wing. (The numbers of inmates in each wing is given in the statement by Mr. Northrup). The men do not always sit in the same places in the dining-room. They come together in the dining-room, in the chapel, and in the "conference" room—those who choose to come. The conference room is not well ventilated, nevertheless, the proportion sick of those who attend the prayer meeting in that room, is less than of those who do not attend it. The men are in the dormitories from 4:30 P. M. to 6:30 A. M. They are in the shops *about* nine hours, now. The closets that have the pail system are two stories high; if the door of the shop is open, the air from over the pails may come into the shop. No one of those who empty the buckets has been sick; two are colored men, they are young and strong. The men usually use the closets in the shops in preference to the buckets in the dormitories. The bucket is taken out of each cell in the morning, and carried to the bucket ground, and in about half an hour it is emptied, rinsed out, then rinsed with bi-chloride of mercury and chloride of zinc, which disinfectant is emptied from bucket to bucket. It consists now, of one part of mercury to 200 of water; formerly it was one to 400 parts. After rinsing, powder of carbolated lime is dusted in. Wooden buckets are mostly used; but some are of painted paper.

The milk supply is from three sources, is apparently good and fresh. I (Dr. Williams) have treated nine cases of typhoid fever in the city, in five families, and all had milk of one man (Mills), one of the three men who supplied milk to the prison. Because of this fact, suspicion was aroused and his supply was stopped a week last Friday. He has about sixty cows of his own, and he bought milk of three other persons. No discoverable fever or source of infection at Mills' or at the three others. At Mills', however, there is a drive-well, and a privy about twenty feet distant. He waters his cows at a stream in the barn-yard. The stream comes from a marsh.

The first officer taken sick was Relyea, aged about forty-two, whose post (4) was over the bucket ground. Perhaps this was before any convict had the fever. He has his meals outside, except dinner at his post. Brunger, aged about twenty-six, had abortive typhoid. He had taken the place of Relyea. Brunger was sick two or three weeks after he relieved Relyea. Mr. Hosmer is on post four now; he relieved Brunger, and is still well. He is about twenty-eight years old. Officers come on the post about 6:15 A. M., and go off about 4:30 P. M. Mr. Hawley worked in the yard. He had abortive fever; was sick about one week. There are about 180 *free* men in the yard—come in from the outside; they use the same closets and the same water. No cases of typhoid have been heard of in those free men.

Dr. Williams says they have had among the prisoners many cases of "ambulatory" fever, which perhaps should be included in the total cases which have occurred. He will find the number from his books. He cannot say that they have any connection with this outbreak; have had the same sort of cases at other times.

The milk supply goes equally to both wings. Of the three men mentioned, Relyea, Brunger and Hosmer, all had milk. Eight night guards and the warden all had it, and none of them were sick.

WARDEN HATCH says:—The milk from one farm is received at noon. There is used 1,600 pounds of milk a day, received from three men; 800 from Amos Root. Saturdays not so much milk is used or received. The men are given their choice of milk or meat (see statement by Mr. Willetts). At night every man has a pint of milk. Blakely supplies from 100 pounds to 200 pounds. Mr. Lane, yard-master, investigated Mr. Blakely's. He found foot-rot there; but Blakely claims not to use milk from those animals sick with it. At Amos Root's the water is from flowing artesian wells.

MR. HOWIND says:—The new well water at the prison was first used in August; about the first. The well is about six or seven feet from a two-foot brick sewer. It is excavated six feet to the rock, tubed twenty-four feet from top of ground, eighteen feet into the rock; there is a ten-inch hole in the rock; the pipe is eight inches in diameter. The sewer is a little above the rock. The sewer is not used on the house side of the well. About fifty feet of it had been used for roof-water, etc. It is the main sewer, and is now used between the well and the river, the hospital sewer entering it about seventy-five feet from the well toward the river. A twelve-inch sewer was put in about eight years ago, which passes about twenty feet from the well. The cast-iron casing outside of the wrought-iron pipe in the well goes down about nine feet. The water stands in the pipe about fourteen to fifteen feet down from the surface of the ground. They had typhoid here about five years ago. (See Boyle's account.)

Last autumn, probably September, the vent on sewer outside of the prison wall was *covered* up, by contractor, with rock and earth. [But any sewer-gas must at any time go back toward the prison, because the ventilator is not between the trap and the building, but between the trap and the river, which is only a few rods distant.]

Before August 1 the drinking water came for three months from the city supply. Before that, for eight years, from another well in the yard. All has come from the new well since August, and no unusual typhoid fever occurred until about Christmas. ... cases (see statement by the doctor's clerk) in the beds in the S. W. corridor, one case has occurred in the S. corridor, in the E. wing (near the break in the soil-pipe); no case in N. corridor, east wing. Until the day before Christmas there was not much of a trap to the hopper at the east end of the west wing. Now there is an S. trap above the floor. There is no provision for fresh-air inlet in the west wing. In "east-end" building there is a fresh-air inlet.[*] At the east end of the east wing is a foul-air shaft divided into four parts, one used for the east wing, and the other three for the three tiers of cells in the "east-end" building adjoining.

MR. BOYLE says five years ago, that is in the fall of 1882, there were cases of typhoid fever. The first case was the book-keeper. The next was the cellar-kitchen man, who died. Four or five were from the kitchen, then it spread; it even went to the coal mine. It spread to every shop. There were thirty-three cases within a month. It commenced in October and lasted until after Christmas. The last case was on the bucket grounds.

The overflow from the tank over the hospital is into the soil-pipe. It is said to be trapped just outside of the tank, but a trap there would be of no use because the tank has never been known to overflow into or through that pipe. The tank supplies drinking water to the hospital. No cases of typhoid have been traced to this water. Sewer-gas might go up the overflow.[†]

MR. E. F. WILLITS says:—Root's milk—about one-half of all used—comes first, about 9 A. M. that is used for *dinner*, with mush and bread. *All* take this twice a week.

All convicts are classified in three sections which always sit in same place in dining-room.

One-third are obliged to take milk twice every week; the other two-thirds can have meat or milk from choice. Consequently about one-half take milk every day. The west wing convicts are fed first,[‡] occupying every other table on both sides of the center of the dining room. After the

Mr. Root and the State have cans in partnership; his milk remains in the cans, taking cans back next day.

---

[*] But we found it closed. It has probably not been opened this winter.

[†] I (Dr. Baker) inspected the two tanks in the garret and found that one of them does not overflow; but the first tank was overflowing when I visited it, and the trap is not near the tank, but near the soil-pipe, between it and the junction of the pipes from the two tanks. The trap would therefore be kept filled as long as either tank overflowed; but it is dangerous whenever water is scarce or pumping is intermittent. The tanks should not be allowed to continue to overflow into the soil pipe.

[‡] All the tables are set and supplied with the milk at the same time, and before the men come in. west convicts have retired the east wing convicts come in and occupy the remaining tables. The same routine is observed in the morning. Bread and milk and tea go to the dormitories about 4:30 P. M.

Messrs. Mills and Blakely bring the milk in their own cans, and empty it into prison cans, so that it is not practicable to tell which wing gets it.

Mr. Willits thinks Hutchinson was the first case sick this time, about six weeks ago. He formerly took milk; two or three weeks before he was taken sick he left off milk, except twice a week when he was obliged to take it.

Out of the kitchen force of 23 men there was one case of fever, and one other who came down about a week after coming to the prison. These kitchen men drink more milk than the other convicts, and were about the last cases to come down. [Two cases out of twenty-three would be about nine per cent (87) which is more than the 22 cases out of 361 in the west wing, and more than one-half more than the total 37 cases out of 786.]

Mr. Root's milk is *not*, as a rule, sent to the wings.

The other two supplied milk every day except Sunday. One or two, possibly three, cans of it might, on some evening, go to one wing.

[If milk on some day were infected, it would explain the greater amount of sickness in the west wing.]

Only the cans used by Mr. Root for milk are kept near the bucket grounds. The cans go out there after dinner, and remain there until Mr. Root's man comes, sometimes when they are emptying buckets, sometimes later. [I have asked Warden Hatch to have a can left out there, then sealed and sent to Prof. Vaughan, H.B.B.].

Those who take meat take water at dinner. At breakfast they have a choice of coffee or water.

Mr. Northrup says: There has been no material change of convicts from one wing to the other. Last night there were 338 in the west wing; some are out, sick. He thinks this winter the highest number was about 364. There are *now 22 patients* from the west wing in the hospital. The capacity of the west wing is 361 (41 cots). East wing:—Last night there were 359. In the "east end" building there were 28. One, Murray, from that room has typhoid in hospital. There is capacity in the east end for 36, but as it is run it is for 30, six vacant cells.

There are *now* in hospital from east wing 11. In hall, (on cots) E. S. 3 sick, fever;* in E. S. base tier, 3 sick, fever; in first gallery, 1 sick, rheumatism; in second gallery, none sick; in third gallery, none sick; East North:—In hall. (on cots) 1 sick, of fever, (taken sick second day after reaching prison, in hospital three or four days after); base tier, three sick, *fever*; first gallery, two sick, fever; second gallery, none sick; third gallery, none sick. In the east wing there are in the two halls (on cots) 57 men.

There are locked in the base tier in the two sides of the east wing, 73 men; in the two first galleries, 76 men; in the two second galleries, 76 men; in the two third galleries, 78 men; not including the sick; [put them in to compute the per cent]. In the west wing:—In *hall*, south side, on cots there are 38 men, not including one sick, of fever; in south base row of cells there are 41 men, and none sick; West S., first gallery, 41 men, including four sick of fever. West wing, south:—In second gallery, 36 men, not including five sick, all with fever; third gallery, 39 men, not including two sick, of fever. The west wing is one cell longer than the east wing. West wing, north: (no cots)—Base tier, 36 men, none sick; first gallery, 37 men, not including four sick, of fever; second gallery, 38 men, not including three sick, of fever; third gallery, 37 men, not including three sick, of fever. West wing, *north side*:—First gallery, all from polishing shop, No. 13, four sick in that shop, of fever.

The fever started in the second gallery, south and north, in west wing, the men work in "20 shop"—wagon contract, wood-work, ground floor. Hutchinson, locked in 56 second west, south. There are now six sick from that "20 shop." In this shop the tubs are used in the closet. "The trip hammer shop," No. 11, has five sick. They have a latrine ventilated into the chimney.

Mr. Howind says:—The opening into the foul-air shaft, west wing, is about five feet lower than into the one in the east wing. The shaft in the east wing is about 75 feet high. The area of the shaft in the east wing is sixteen square feet (4 feet by 4 feet), divided into four parts by four inch partition walls. Three parts ventilate the east end, one part the east wing. The area of opening into the shaft in the east wing is 24x30 inches.

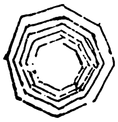
The shaft at west end of the west wing is about sixty feet high. The area of the opening inlet is 29x21 inches. The area of the shaft is sixteen square feet (4 feet by 4 feet.)

In the S. W. corner of the west wing there is a hopper.

---

*This part has been compared with the books of the physician's clerk.

There is a shaft about four feet in diameter, octagonal, on the north side of the east wing, formerly used for a ventilator. It might be used again. It is about 117 feet high.



Physician's office:—Shop 1, 1 sick, fever.
Shop 5, 1 sick, not fever.
Shop 6, 3 sick, fever.
Shop 7, 3 sick, fever.
Shop 10, 1 sick, fever.
Shop 13, 4 sick, fever.
Shop 11, 5 sick, fever.
Shop 18, 5 sick, fever.
Shop 20, 6 sick, fever.
Shop 21, 1 sick, fever.
Shop 23, 1 sick, fever.
Shop 24, 2 sick, fever.
Shop 27, 1 sick, fever.
Shop 30, 3 sick, fever.

Mr. Geo. N. Howe says:—Mr. Boyle says to-day there are 34 sick with fever, one taken this morning, making 35.

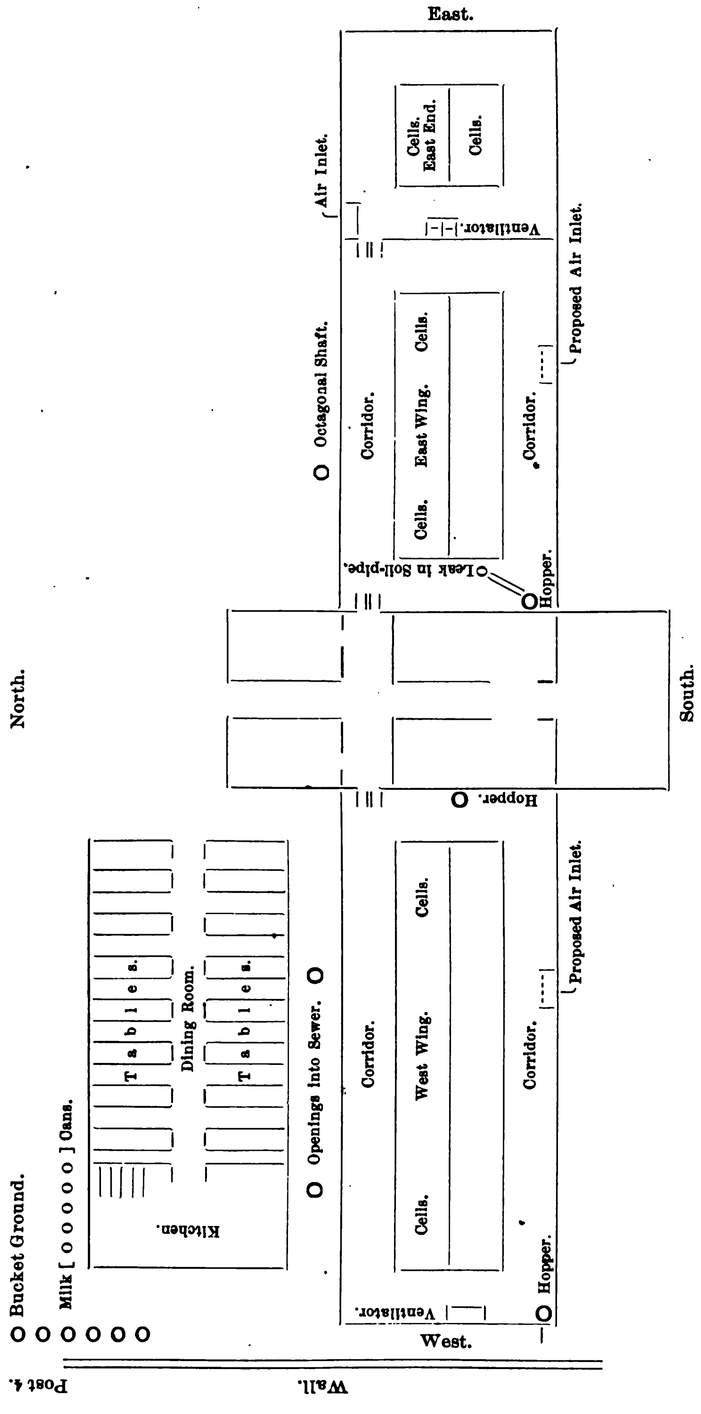
There are eighteen excused in their cells to-day (one, broken arm, one, sore eyes).

Inasmuch as there are two openings into the sewer between the kitchen and the west wing, and as there was quite a current of air out at those openings when I examined them, and the per cent of cases is greatest in the kitchen, and next greatest in the west wing, it seemed possible that the sewer air from those sources might have had influence; therefore I have computed the per cent of cases to men on the two sides of the west wing; but find that no greater proportion on the north side than on the south side were sick with the fever. The per cents are as follows:—

WEST WING.

North Side.	No. of Men.	No. sick of Typhoid	Per cent of men sick of Typhoid.	South Side.	No. of Men.	No. sick of Typhoid	Per cent of men sick of Typhoid.
3d gallery	40	3	7.5	3d gallery	41	2	4.9
2d gallery	41	3	7.3	2d gallery	41	5	12.2
1st gallery	41	4	9.8	1st gallery	41	4	9.8
Base tier	36	0	0.0	Base tier	41	0	0.0
Total	158	10	6.3	Total	164	11	6.7
Corridor	0	0	0	Corridor	39	1	2.6

PLAN OF STATE PRISON, JACKSON, MICHIGAN.



East Wing.	No. of men.	No. sick of Typhoid.	Per Cent of men sick of Typhoid
3d Gallery (both sides)	78	0	0.0
2d Gallery " "	76	0	0.0
1st Gallery " "	79	2	2.5
Base tier " "	79	6	7.6
Corridor	61	4	6.6
Total	373	12	3.2

West Wing.	No. of men.	No. sick of Typhoid.	Per Cent of men sick of Typhoid
3d Gallery (both sides)	81	5	6.2
2d Gallery " "	82	8	9.8
1st Gallery " "	82	8	9.8
Base tier	77	0	0.0
Corridor	39	1	2.6
Total	361	22	6.1

Summary.	No. of men.	No. sick of Typhoid.	Per Cent of men sick of Typhoid
"East End"	29	1	8.4
Kitchen and dining-room	23	2	3.7
East wing	373	12	3.2
West wing	361	22	6.1
Total	786	37	4.7

The following preliminary report was sent by the Secretary to H. F. Hatch, Warden of the State Prison:

JACKSON, MICH., January 17, 1888.

H. F. Hatch, Warden of the State Prison:

DEAR SIR,—The State Board of Health has directed me to acquaint you and the Prison Inspectors of the conclusions thus far reached, without waiting for the results of analyses and examinations to be completed:

We regard the defective condition of the sewers, combined with the insufficient supply of fresh air, as the most probable cause of the present sickness.

1. We recommend: That before there is any digging into sewers or drains, thorough disinfection be done by pouring into each hopper, or other opening into a sewer, half a barrel of solution of bichloride of mercury, one part of chloride to 400 of water.

2. That the sewer from the hospital and all its branches be taken up, to the outside of the building, properly relaid, the soil pipe extending full size to above the roof, and properly ventilated, having an air inlet outside the building and a pipe therefrom extending up unobstructed outside the building.

3. That suitable provision be made for at least two fresh-air inlets into each of the two wings, on the front (south) side of the building, and that the inlets to each wing have a combined area of not less than sixteen square feet. Each inlet to have steam radiator or pipe surface to properly warm the air as it enters.

4. That as soon as the fresh-air inlets are provided, the ventilators in the ceiling be closed whenever artificial heat is employed or needed.

5. That an immediate investigation be made of any possible connection of soakage or leakage from the sewers with the well from which the water is obtained; careful examination to be made of the earth and rock in the vicinity of the well, to a depth of several feet, and extending to near the sewers in its vicinity.

6. That as soon as practicable the entire system of sewerage and drainage be remodeled, under the direction of a competent sanitary engineer.

Very respectfully,

HENRY B. BAKER,
Secretary.

At the west end of the west wing there is a high ventilating shaft, having a sectional area of sixteen square feet, through which there is a powerful draught of air. Inasmuch as in the west wing there is no provision whatever for the inlet of fresh air, there is, sometimes at least, a draught through the grated passage from the east wing to the west wing, and, except when a door or window is open in the west wing, there is a draught from all openings through which air can enter the west wing, which openings, about the time the most cases of fever were contracted, included an imperfectly trapped hopper connecting with the sewer at the east end of the west wing; and while we were investigating, bits of paper laid over cracks in the pavement were made to flutter by the incoming air. At the west end of the east wing, there was a leak in the soil pipe which came down from the hospital and into which discharges from typhoid fever patients were thrown, the greatest effect of foul air or germs from that leak would be quite likely to be upon prisoners in the west wing, because of the current of air being in that direction. Any sickness from foul air or germs from the slop hopper opening into the sewer at the east end of the west wing would also be likely to be upon prisoners between it and the large outlet for foul air at the west end of the west wing. The ventilating shaft at the east end of the east wing is the same size as that at the west end of the west wing, but the part of the shaft devoted to the east wing is only about one-fourth of its area; of course some foul air would pass out in this direction, but perhaps not as much as would go toward the larger ventilating shaft in the west wing.

In order to learn whether the air of the sewer under the building actually contained the supposed specific cause of typhoid fever (the bacilli described by Eberth), a clean bottle was sterilized by boiling water, filled with water recently boiled, and, an opening having been made into the sewer near the hopper at the east end of the west wing, the bottle was inverted, the stopper removed, and the bottle filled with the sewer air. This was taken by Prof. V. C. Vaughan for examination in the laboratory at the university.

The Secretary of the State Board of Health remained in Jackson about a day longer than did the other members of the Board, and investigated several places in and about the prison, including the water tanks in the garret over the hospital, and the openings into sewers between the west wing and the kitchen. He did not eat or drink at the prison. Not long after he returned to Lansing he was taken sick, and was then sick for about three weeks with a fever which had nearly all the signs and symptoms of typhoid fever. He believes it was typhoid fever.

At the meeting of the State Board of Health held April 10, 1888, Dr. Vaughan reported that he had found the typhoid bacilli, the so-called typhoid "germs," in great abundance in the air taken from the "dead end" of the sewer at the east end of the west wing at the State Prison at the time of the outbreak of typhoid fever there. With these additional statements the preliminary report stands as the final report of the examination.

Respectfully submitted,
HENRY B. BAKER,
Secretary.

TYROTOXICON AND OTHER POISONINGS IN MICHIGAN IN 1887.

For many years the causes of the poisonings by ice cream, buttermilk. cheese, canned meats, head cheese, sausage, etc., remained unknown, Each time such cases were reported to the State Board of Health, whenever it was practicable to do so, samples of the substances supposed to have caused the sickness were obtained and placed in the hands of some chemist or other investigator with the view of learning, if possible, the cause of the poisoning. At different times such substances have been sent by the Michigan State Board of Health to Prof. R. C. Kedzie, of the Michigan Agricultural College, to Prof. Burrill, of the Illinois Industrial University at Champaign, to Dr. George M. Sternberg, of the U. S. Army, the well-known bacteriologist, and to Prof. Victor C. Vaughan, of the Michigan University. Finally, in a case of poisoning by cheese, samples were sent to Prof. Vaughan, who worked out the cause, and named it "tyrotoxicon." He found this poison in ice cream which had caused wide-spread sickness in a community. His work has now been verified by many chemists, and is known around the world. Whoever wishes to consult the original papers, in this line of research, can find them in the annual reports of this State Board of Health; those by Prof. Vaughan being on pages 154-164 of the report for 1886, and on pages 12-19 and 177-185 of the report for 1887. Prof. Vaughan's articles have been reprinted, and may be obtained in pamphlet form.

The instances of such poisonings in Michigan in 1887 were not very numerous, and the details have not been as thoroughly worked out and reported as in some previous years. Possibly the publication of the cause and Prof. Vaughan's suggestions how to prevent the formation of tyrotoxicon may have had some beneficial result already in preventing poisonings by cheese, ice cream, etc. The cases of poisonings which have come to the notice of the office of the State Board of Health are as follows:

Poisoning at Alpena, by Buttermilk.

On April 29 a report was received at this office of the poisoning of eight persons at Alpena, by drinking buttermilk. The local health officer says:

> "This buttermilk was churned yesterday morning, April 28. In the afternoon the lady had a few friends come in and six of them were taken ill half an hour after partaking of it with vomiting and purging. In two or three hours after, the vomited matter was nearly all blood. They are all improving this morning.
>
> "The husbands of two of them thought there must have been some other cause, and they partook of the same, with the same result.
>
> "Investigation throws no light on the subject. There is no history of any poison being used in or about the house."

It seems probable that if tyrotoxicon had been tested for in the buttermilk it would have been found.

Reported Poisoning at Bay City, by Ice Cream.

The following item appeared in the *State Republican* of June 7, 1887:

> Bay City, June 7.—On Sunday afternoon the family of George Wanless were suddenly taken violently ill after eating ice cream, with symptoms of poisoning. Several other families, who had purchased ice cream from the same batch, were less violently sick with purging and vomiting. All are now recovered, and the doctors think the cause was tyrotoxicon in the cream.

Poisoning at Novi, Oakland County.

The Detroit *Evening News* of September 21, 1887, contained the following item:

> Novi, Mich., Sept. 21.—A case of wholesale poisoning took place at the Spencer house in this village yesterday afternoon, in which the sufferers were the landlord, Ed. Spencer, his wife, their child, the hired help, a guest named Ed. Pierson, from Detroit, a doctor who lives at Wayne and whose name is unknown, and Mrs. C. L. McCrumb, of this place. The entire party had partaken of a dinner of corned beef, cabbage, etc., and it is believed the poison emanated from the food. The nature of the poison is not known, however. From the effects it produced Dr. Johnson, the attending physician, is confident it could not have been paris green, although some of that poison had been used upon the cabbage before it was harvested. To-day all are believed to be out of danger except Mr. Spencer, who lies at the point of death. Dr. Brodie, of Detroit, has been summoned, The meat was bought at Farmington, and the dealer who sold it claims that he has sold some of the same lot to various parties about this section, none of whom suffered any bad results.
>
> Novi, Mich., Sept 21.—Ed. Spencer, proprietor of the Spencer house, died at 2:20 o'clock this afternoon from the effects of the poisoned dinner at his hotel yesterday.

A letter was immediately sent from this office to Richard M. Johnson, M. D., health officer of the village of Novi, requesting full particulars, and suggesting that the local board of health have a chemical examination made of the food prepared for the meal on the day of the poisoning.

The following letter was received from Dr. Johnson on Sept. 26 :

"Yours of the 22d inst. at hand and contents noted. In reply would state, that I attended the sick during that attack. It acted to me like arsenical poisoning from the amount of vomiting and purging which occurred. The cases that recovered were six in number, of which all but one commenced vomiting right away after eating, and one of the six commenced about 3 P. M. or about three hours after eating. The fatal case felt sick to his stomach about 2 or 3 o'clock in the afternoon, but did not get to vomiting very much until about 6 P. M., and they called me at 7:30 P. M. Mr. Spencer (the fatal case) vomited almost steady from that time until 1 A. M. Next morning the bowels began moving off (about 10 P. M.) a thin serous fluid like the rice water discharges of cholera, of which disease it bore the strongest resemblance. There was no pain complained of, by any of them, in the stomach, but in the fatal case there were spasms of the muscles of the legs below the knees, and of the feet. There was no darkened discharges from the bowels as I expected to see from arsenical poisoning. So far as the real source of the poison is concerned I know nothing about it, as there was meat, (corned beef) cabbage, potatoes, etc., for a boiled dinner as they called it, but which one of the articles mentioned carried the poison into the kettle no one knows." * * *

Nothing further was received at this office in regard to the subject.

Reported Poisoning at Battle Creek, by Pressed Corn Beef.

The following was clipped from the *Detroit Tribune* of April 15, 1887. Nothing further has been learned of the occurrence :

BATTLE CREEK, April 14.—Several families have recently been poisoned by eating pressed corn beef purchased in this city. Yesterday forenoon S. H. Baker and Frank Epps bought a piece to eat for lunch, and shortly after noon both were taken violently ill. A physician who was summoned said that if he had been called fifteen minutes later the case would have been hopeless. The butcher claims to have prepared the meat himself and is at a loss to account for its poisonous ingredients.

Reported Poisoning at Bay City, by Head Cheese.

Several people were reported poisoned by eating head cheese in Bay City, in April. Nothing definite was learned in regard to the matter.

If health officers, physicians, and others will report to the State Board of Health the details in all instances of general poisoning of communities through the use of such ordinary articles of food as are mentioned in this article, it is quite possible that a continuance of the methods which have already led to the discovery of tyrotoxicon and some of the ways in which it is formed, may lead to further knowledge useful for the prevention of these general poisonings.

HENRY B. BAKER,
Secretary.

INJURIES ALLEGED TO HAVE COME FROM ILLUMINATING OILS IN MICHIGAN DURING THE YEAR 1887.

At the office of the State Board of Health an effort is made to collect the facts respecting every alleged "lamp explosion," or other similar occurrence attributed to the use of kerosene oil, in Michigan. Each year the health officer of each township, city and village is asked to report every fire or lamp explosion due to illuminating oil; and whenever a newspaper report of such an occurrence is seen an effort is made to learn the facts. Not infrequently the Deputy Oil Inspector in the locality investigates and reports that the newspaper report was an error—that the fire was not due to kerosene oil, or that no lamp exploded.

More or less definite information, however, has reached this office concerning five explosions from the use of kerosene oil in Michigan, during the year 1887. (Several reported explosions, with loss of life, in other States have come to the knowledge of the office; but as it is impossible to obtain reliable details in all cases, none are included here.)

There is no authority for stating that the oil causing any of the accidents enumerated in this article was below the legal test, but on the contrary we have the report of the Deputy State Oil Inspector in several instances verifying that the oil in use was up to the test, therefore the explosions may be attributed to carelessness in handling and using, or to the fact that the test is too low for safety.

Burning of Passenger Propeller Champlain.

By far the greatest calamity of the year, supposed to have been caused by the explosion of a lamp, was the burning of the passenger propeller, Champlain, of the Northern Michigan Line, on the night of June 16, 1887, on Lake Michigan, about six miles from Charlevoix, causing the loss of twenty-two lives or more, and the burning of a steamer.

On the night of the fire the lamps used on the boat were all said to have been filled with lard oil except the chandeliers and the two kerosene lamps used in the engine room. Had the order been reversed, and the engine room lamps been filled with the lard oil, it is possible that these lives might have been saved and the property loss not recorded.

While it is impossible to ascertain the test of the oil used in these two lamps, it is doubtful if the oil at even the Michigan test of 121 degrees or better would not generate explosive gas in the engine room, carried as these lamps were said to be, fastened to the ceiling (the warmest place in the room).

Regarding the above mentioned occurrence, the Charlevoix *Journal* of June 17 says:

"Last night, about midnight, the propeller Champlain, of the Northern Michigan Line, was discovered on fire two miles off Smithson's camp, about six miles from Charlevoix. As near as we can learn, a lamp exploded in the fireman's room, and in an instant the engine room was filled with heat and flame and the engineer was severely burned. The propeller then headed for shore, but her speed so interfered with lowering the small boats that the passengers and crew were driven into the water, as their only chance for life. It is impossible now to learn the number lost, but it is believed to be over thirty."

In his evidence before the coroner's jury, one of the passengers, Mr. W. B. Albright, of Chicago, states:

"Just before midnight, while Mr. Russell, Mrs. Smith and myself were in the cabin, we heard the most unearthly shrieks. I afterwards learned that it was the poor engineer, who rushed up to the upper deck with his clothes all on fire."

"Charles A. Lacomb, of Fort Mackinac, second fireman, says:

'The fire originated in my room. I was awoke from my sleep by hearing the lamp fall upon the floor. When I woke I saw the corner of my room all ablaze between the head of my bunk and door, and the carpet was on fire. The fire was right below where my lantern hung. The lantern had hung from the ceiling by a hook.'"

"Henry Bean, porter of the Champlain, states:

'I think I was the last one to leave the boat. I filled the lamps on the boat with lard oil excepting the two kerosene lamps used in the engine room and the chandeliers, which I filled with kerosene.'"

Under the head of "Miscellaneous Notes" the same journal states:

"Although the story of the explosion of the lantern is generally accepted as the correct one, a member of the crew asserts that the lamps and lanterns used on the Champlain could not explode, and that a theory more reasonable to his mind, was the very close proximity of the dome of the boiler to the woodwork of the fireman's room. This theory will better explain the immediate communication to, and the intense heat in and around the engine room, so soon after the discovery of the fire."

In these extracts we find evidence that the lamps (or lanterns) used in the engine or boiler room were filled with kerosene, and that it was a very warm place, and that if, as is usually the case, one was placed close to the dial of the steam gauge, (the latter being usually placed directly over the front part of the boiler) it would indicate that it occupied the hottest place in the room, a position too warm for the safe use of ordinary kerosene oil.

A Case of an Overheated Lamp in Detroit.

Below is given a copy of a letter from Department Inspector Bolger, to Inspector Hon. H. D. Platt, which was kindly furnished this office by the latter official:

"In answer to yours asking for report of an item appearing in the Detroit *Evening News* of Sept 20, about a lamp explosion at Dixon's barber shop, No. 715 Woodward avenue, the first intimation I had of it was from the item you speak of. I investigated the same evening, and found that the item had so exaggerated, that I did not think it necessary to report it to you.

"The circumstances are these: Mr. Dixon not having an oil stove at the time, (he has got one now) he undertook to manufacture something that would be equally as good for his purpose, 'that of heating water for shaving,' so took a wooden box, cut a hole in the bottom, set the box upside down on the stand with a lamp inside, his kettle set over the chimney of the lamp. He claims that it would have worked all right, but that he turned the wick up too high, the chimney became so hot that it melted, causing it to smoke so much that it attracted the attention of his customers, he ran to extinguish the lamp and in doing so knocked it over, the box catching fire, and to extinguish it he had to throw it out of doors, the fall on the ground broke the lamp, loss about forty cents."

The foregoing is an instance of a lamp being placed in a position in which the heat generated by its own flame was sufficient to *melt glass*, and that within a few inches of the globe containing the oil.

A Lamp Explosion in Adrian.

The following letter was sent by Wm. Jibb, Deputy Oil Inspector of Lenawee and Monroe counties, to Hon. H. D. Platt, State Inspector, on October 10, which explains the explosion in Adrian:

"Dear Sir:—I have to report (according to law) the bursting of a kerosene oil lamp in the store building of A. J. Kaiser (mayor of the city), which called out the fire department, but without any damage done. I was at the place within ten minutes after it happened and found the facts and circumstances to be like this: The lamp was down in the cellar and placed under the window, almost directly, and the air draft strong, where the air went directly in the *top* of the chimney, and that caused the chimney to break, and the air draft being so strong, and the air passages in the burner being dirty and stopped up, the wind drove the blaze down so that it made the oil very hot which made the gas and caused the lamp to burst, but it was no fault of the oil, as it stood higher than is required by law by four degrees, it being 125 degrees. Hoping this will be satisfactory to you,

I remain, respectfully

WM. JIBB,
Dep. Oil Inspector.

No detailed report was obtained of the following explosions:

From the Detroit Evening News, April 19, 1887.

"A kerosene street lamp in front of W. H. Gillman's saloon, on Randolph street, exploded last night and did about twenty-five dollars damage."

From the State Republican, Lansing, July 16, 1887.

"The explosion of a lamp in the house of Michael Hughes, on Cedar street, caused a slight conflagration at 2 o'clock this morning. The boarders succeeded in putting out the fire after it had completely gutted one room and caused about twenty-five dollars worth of damage."

TESTING ILLUMINATING OIL.

The following is a letter from the Secretary of the State Board of Health to the State Oil Inspector concerning the rapidity with which oil should be heated in testing, and was ordered printed in this report at a meeting of the Board, Oct. 23, 1888:

MICHIGAN STATE BOARD OF HEALTH,
OFFICE OF THE SECRETARY,
Lansing, Mich., March 27, 1888.

Hon. H. D. Platt, State Oil Inspector, Ypsilanti, Mich.

DEAR SIR:—Your letter of March 23 acknowledging the receipt of thermometer is received.

I have been appealed to to inspect a sample of oil rejected by one of your deputies at Bay City, and I learned that the oil had flashed at 117 degrees when tested by him, and had stood 121° when tested by another man who heated it up more slowly. Although I did not test the oil, I insisted that the deputy was right in making the inspection as he did, because the law says "reject, for illuminating purposes, all oils which will emit a combustible vapor at the temperature of one hundred and twenty degrees Fahrenheit's thermometer." Although some of the State inspectors in the past have directed that oil should not be heated faster than two degrees a minute, this is clearly not in accordance with the law which the deputy inspector takes an oath to maintain. If you have followed the other inspectors, I would respectfully suggest the propriety of a change in the instructions to deputies, so that the instructions may conform to the law.

I recognize the fact that there should be uniformity so that those who manufacture oil may know what is expected of them.

Very respectfully,

HENRY B. BAKER, *Secretary.*

P. S. At first sight it may not seem clear how the instructions are not in accordance with the law; but if the law states that oil which flashes at 120 degrees shall be rejected, and if a given sample of oil, tested *in one manner*, does flash there, then any instructions to heat in *some other manner* in which it would not flash at that temperature, would violate the provisions of the law. If the instructions read, to "heat as fast as is practicable" then it seems that the law would be complied with.

Very respectfully,

HENRY B. BAKER.

DANGERS FROM THE USE OF GASOLINE IN 1887.

There were but few reports received at this office during the year 1887 of dangerous occurrences from the use of gasoline. Probably not all such occurrences were reported.

While we have a law regulating the sale of kerosene, we have no law regulating the sale and use of gasoline. That gasoline is by far a more dangerous fluid than kerosene for domestic use cannot be disputed, for the reason that it will give off an explosive vapor at the ordinary temperature of the atmosphere, while kerosene will not emit any such gas unless heated from 30 to 50 degrees higher. Yet we find gasoline in use in our State in the hands of hundreds of persons who do not know that the vapor arising from it, when mixed with the atmosphere in the proper proportion, is one of the most dangerous explosives. We would doubt the sanity of an individual who would permit a can of ordinary gunpowder to hold a permanent place in his kitchen, within a foot or two of the fire in his range; yet we may find the same person with the more dangerous gasoline in the midst of his family, while all that is necessary to cause an explosion, which may carry with it destruction and death, is an imperfect stove or the spilling of the fluid, and an accessible light.

The fluid spilled upon the floor, or a can left uncovered may emit enough vapor to bring the air of an ordinary sized room to the exploding point, and all that is then neccessary to bring about the explosion is the bringing into the room of a lighted match or lamp. If the vessel containing the gasoline is in the room at the time, the contents may immediately ignite and a conflagration result, with perhaps the maiming for life, or the death of some member of the family.

This subject is more fully discussed on pages 24–28 of the Report of this Board for 1887, in a report by J. H. Kellogg, M. D., who was a special committee of this Board on the subject. His report contains a series of "Rules for the use and care of gasoline."

A Fire from Gasoline in Jackson, Mich.

A fire occurred from the use of a gasoline stove in the city of Jackson on October 20, 1887, resulting in the death of Mrs. Alvin Porter, and seriously injuring her little daughter. Just how this was brought about will never be known. Mrs. Porter was alone in the room at the time, and could not have been filling the tank, as that had been attended to in the morning before the burners had been lighted. It is thought that one of the burners was not in the best of order, that a draft of air blew out the blaze of this burner, the doors on both sides of the house being open, and that the fluid dripped onto the shelf below where it was ignited and flashed over her clothes. The fire occurred between 11 and 12 o'clock A. M. The lady died at 6:30 P. M. The loss of property was estimated at one thousand dollars. The facts have been learned from Dr. Mitchell, health officer of Jackson.

Fatal Burning by Gasoline in Hastings, Mich.

A letter of inquiry from this office to the health officer of the city of Hastings in regard to an occurrence in that city, elicited the following reply:

DEAR SIR: In reply to yours of March 28, would say: Mrs. Hayford was burned in the following manner: In some manner the gasoline had leaked out on the floor, not noticing, she attempted to light the stove, and was enveloped in flames. She was burned badly on one arm and on the neck and shoulder, and somewhat about the neck and face. The burns at first did not seem serious, but she did not rally from the shock, being an old lady about [illegible] years of age. She died the third day after being burned. The accident was due no doubt to her carelessness. These are the facts as near as I can learn.

Respectfully,
E. H. LATHROP, M.D.

Supposed Fatal Burning by Gasoline at Marshall, Mich.

This occurrence in Marshall was about October 24: "Mrs. D. C. Talmage was lighting a gasoline stove this morning, when her clothing caught fire and she was terribly burned, the flesh being roasted from portions of her body. She will probably not recover." *Detroit Evening News*, October 25, 1887. The Health Officer, Dr. E. J. Marshall, reported Oct. 30, 1887, that the foregoing was substantially correct, yet "she possibly may recover." No later report was received.

Severe Burning by Gasoline at Bay City, Mich.

The facts respecting this occurrence have been supplied by J. W. Coughlin, M.D., Health Officer, and R. W. Erwin, M.D., member of the Bay City Board of Health: John Young, a plumber, was terribly burned by an explosion of gasoline used in a reservoir with a burner and solder pot attached. Whether or not it was a machine of his own invention, was not learned. It was a strangely-constructed machine, the gasoline reservoir was directly under the burner, which was a coiled pipe, perforated for the escape of the gas and fluid, the pressure to raise the gasoline to the burner was obtained by blowing air from the lungs into the reservoir. The tube for blowing into the reservoir was also attached to its top, and was closed by a valve when not in use; being left open, it gave a direct passage to the interior of the reservoir, by which the flames reached the gas inside and caused the explosion.

Mr. Young was severely burned but recovered. The machine was a poorly constructed apparatus for using an article which is more dangerous than gunpowder.

A circular on the dangers in gasoline, with rules for the use and care of gasoline, by John H. Kellogg, M. D., member of the Michigan State Board of Health, was printed and circulated from this office during the year. It is printed on pages 24–25 of the annual report of this board for 1887.

A PROPOSED LAW TO PROMOTE SAFETY IN THE USE OF GASOLINE.

A BILL

To Require the Labeling of all Gasoline, Benzine and Naphtha Sold at Retail.

SECTION 1. *The People of the State of Michigan enact*, That every druggist, grocer, or other person who shall sell and deliver at retail any gasoline, benzine or naphtha, without having the true name thereof and the words "explosive when mixed with air" plainly printed upon a label securely attached to the can, bottle, or other vessel containing the same, shall be punished by a fine not exceeding one hundred dollars.

Respectfully submitted,
HENRY B. BAKER,
Secretary.

PREVENTION AND RESTRICTION OF SMALL-POX.

DOCUMENT ISSUED BY THE MICHIGAN STATE BOARD OF HEALTH.

(Revised Edition of 1889.—10,000 copies reprinted from the Annual Report of the Board for 1888.)

PREVENTION OF SMALL-POX.

1. **Small-pox a preventable disease.**—It has long been known that small-pox can be prevented or modified by vaccination. It is now believed that a wide-spread epidemic of the disease can be attributed only to an equally wide-spread ignorance or willfulness concerning small-pox and its prevention by vaccination.

2. **Why vaccinate.**—Because unmodified small-pox is so deadly a disease, and so often disfigures and enfeebles those who recover,* and because by traveling or by travelers, by articles received in the mail or from stores or shops, or in various other ways any one at any time may without knowing it be exposed to small-pox, it becomes important so far as possible without injury to health to render every person incapable of taking the disease. This may be done so perfectly by vaccination and revaccination with genuine bovine vaccine virus that no question of ordinary expense or trouble should be allowed for a day to prevent the careful vaccination of every man, woman and child in Michigan, and the revaccination of every one who has not been vaccinated within five years. It is well established that those who have been properly vaccinated are far less likely to take small-pox if exposed to it, and that the very few who have been properly vaccinated and have small-pox have it in a much milder form and are much less disfigured by it than those who have not been thus vaccinated. The value of vaccination is illustrated by the following facts:—

On March 13, 1859, Dr. E. M. Snow, of Providence, R. I., found, in a cluster of seven houses, twenty-five families, and in these families ten cases of small-pox, all apparently at about the same stage of the disease. In the same families there were twenty-one children who had never been vaccinated. The ten cases and the remaining members of the families including the twenty-one children were quarantined at home, and the children were all vaccinated and compelled to remain with the sick. Several other cases of small-pox occurred in persons previously exposed, but not one of the twenty-one children referred to had the slightest touch of the disease.

---

*"Among those who outlive it, many either totally or partially lose their sight or hearing; many are left consumptive, weakly, sickly, or maimed, many are disfigured for life by horrid scars, and become shocking objects to those who approach them. Immense numbers lose their eyesight by it."—*La Condamine.*

In Sweden the average number of deaths in each year from small-pox per one million inhabitants was,—

Before the introduction of vaccination (1774-1801), 1,973;
During the period of optional vaccination (1802-1816), 479;
And during the period of obligatory vaccination (1817-1877), 189.

Vaccination was introduced in England near the beginning of the present century, and since 1853 compulsory vaccination has been attempted. In England the number of deaths in each year from small-pox per one million inhabitants was,—

At the close of the last century, 3,000;
From 1841 to 1853 (average). 304;
From 1854 to 1863 (average), 171.

In the Bavarian army revaccination has been compulsory since 1843. From that date till 1857, not even a single case of unmodified small-pox occurred, nor a single death from small-pox.

During 42 years of duty, Dr. Marson, physician of the London small-pox hospital, has never observed a single case of small-pox in the officers and employees of the hospital, who are revaccinated when they enter the service, and who are constantly exposed to the infection.

"Out of more than 10,000 children vaccinated at Brussels with animal lymph, from 1865 to 1870, and who went through the terrible epidemic of small-pox which in 1870 and 1871 frightened the world, not a single one was, to my knowledge, reported as being attacked by the disease. The same immunity was shared by those—a much larger number—whom I had revaccinated, and who at the same time were living in epidemic centers."—Dr. Warlemont, of Brussels.—[North Carolina Medical Journal, January, 1880. Vol. v., p. 2.]

3. **Who should be vaccinated.**—Everybody, old and young, for his own interest and that he may not become a breeding-place for the distribution of small-pox to others, should seek that protection from small-pox which is afforded by vaccination alone. It is believed that all persons except those mentioned in the following paragraph may, if the operation is properly performed, at the proper time, and with pure bovine virus, be vaccinated with perfect safety to themselves. Even those who have had small-pox should be vaccinated, for otherwise they may take the disease; and it seems to be proved that a larger proportion of those who have small-pox a second time die than of those who have the disease after vaccination.

4. **Who should not be vaccinated.**—Unless exposure to small-pox is believed to have taken place, or likely to take place, teething children, pregnant women, persons suffering with measles, scarlet fever, erysipelas, or susceptible to and recently exposed to one of these diseases, persons suffering with skin disease or eruption, and in general feeble persons not in good health, should not be vaccinated. In all cases in which there is any doubt as to the propriety of vaccinating or postponing vaccina ion, the judgment of a good physician should be taken. The restriction as to vaccinating teething children makes it important that children should be vaccinated before the teething process has begun, because small-pox is very much more dangerous than vaccination. Small-pox is exceedingly dangerous to pregnant women.

5. **When should a person be vaccinated.**—The sooner the better as a rule, and especially whenever there is much liability of exposure to small-pox. Children should be vaccinated before they are four months old; those who have never

been vaccinated, should, with the exceptions previously made in paragraph 4, be vaccinated at once. Because the vaccination often loses its protective power after a time, those who have been vaccinated but once or twice should, in order to test and to increase the protective power of the former vaccination, be vaccinated again and as often as the vaccination can be made to work. For the first three or four scars the protection afforded is believed to be somewhat in proportion to the number of good scars, conditioned always that the scars be the result of a proper vaccination with genuine vaccine virus. In general, to insure full protection from small-pox, one should be vaccinated as often as every five years. It has been found that of those who have small-pox the proportion of deaths is very much less among those who have three or four good vaccination scars than among those who have but one scar.

Vaccination as late as the second day after known exposure to small-pox is believed to have prevented the small-pox; vaccination the third day after exposure has rendered the disease much milder than usual, and, in a case in Iowa, vaccination on the seventh or eighth day after exposure to small-pox ran a partial course and was believed to have modified the attack of small-pox, which, however, it did not wholly prevent.

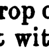
6. **With what should one be vaccinated.**—Virus taken from the arm of one vaccinated a second time is worthless because unreliable. Virus dissolved and carried about between glass slips in the pocket of the vaccinator is liable to contamination and fermentation; bovine virus dried on ivory or quill points is preferable. It should be remembered that a spurious vaccination which does not produce a vaccine vesicle, while it affords no protection against small-pox, may prevent subsequent vaccination which shall be protective. For this reason it is important to use only virus from reliable sources and free from contamination or decomposition. In a majority of cases, if the virus be taken at the proper time (eighth day after vaccination) from the arm of a healthy child having no taint of a hereditary or communicable disease, such as scrofula, consumption, syphilis, erysipelas, scarlet fever, etc., and undergoing the action of its first vaccination, and if a properly clean lancet be used, no harm will result to the person vaccinated, and a good vaccination may be secured. This method involves rupturing the vesicle on the arm of the child from whom the virus is obtained, and this is objectionable because it may interfere with the complete development of its vaccination. But because harm has sometimes resulted from the use of virus taken from another person, because it is often impossible to tell whether a child has pure blood and is free from every disease, because it is so easy to obtain pure and fresh bovine virus, and because such bovine virus is efficient, it is better in all cases to use only the pure and fresh bovine virus.

Reasons for preferring bovine virus to humanized virus may be given as follows:—(1.) By the use of the bovine virus there is secured a more perfect or typical development of the vaccine disease; and hence it may fairly be inferred a greater protection against small-pox. (2.) With the bovine virus and with a clean lancet, and with clean surroundings, there is no danger of communicating syphilis. (3.) The bovine virus is far more effective than the humanized virus in revaccination; and where the humanized virus fails and the bovine virus works it is probable that there was susceptibility to small-pox which the humanized virus did not remove but which has been removed by the bovine virus. (4.) Greater care can be taken in the propagation of bovine virus, a greater supply can be always at command, and always, but especially in times of urgent danger from small-pox people can have a better guarantee that they are vaccinated with genuine and pure vaccine virus.

7. **Where to obtain fresh and pure bovine virus.**—Dr. E. L. Griffin, of Fond du Lac, Wis., by a series of inoculations of young heifers propagates virus of the Belgian stock of cow-pox, obtained from Dr. Warlomont, director of the government vaccine establishment of Brussels. This virus, so far as known, never has passed through the human subject. It is stored on ivory points, each of which holds enough virus to vaccinate one person, and should be used only for one person. Ten points are sent by mail for one dollar; and if used according to the directions of Griffin's circular within five days of the receipt of the package their efficiency is guaranteed by him. Dr. Henry A. Martin and son, Roxbury Station, Boston, Mass., propagate virus of the Beaugency stock. Dr. Martin claimed the honor of being the first propagator of bovine virus in the United States. Both Dr. Griffin and Dr. Martin are believed to be reliable propagators of bovine vaccine virus. Virus is for sale by most druggists. The State Board of Health does not supply vaccine virus.

8. **Where should vaccination be performed.**—In a room or place free from persons suffering from disease, and from dust or vapors which may convey to the scratched surface germs of any communicable disease; certainly not in or near a room where there is erysipelas, nor in the presence of one who has just come from a person sick with erysipelas, diphtheria, or scarlet fever.

9. **By whom should one be vaccinated.**—The operation of vaccination should be performed always by a competent and responsible physician, or by some one whom he has instructed and recommends to perform the operation. To try to vaccinate one's self or one's family is poor economy, for it often results not only in a waste of money and of time but in a false and dangerous feeling of security. To trust to vaccination by nurses and midwifes is equally foolish. A well-educated and experienced physician has the skill, and the special knowledge necessary to the best judgment on all of the questions involved, without which the operation may be a failure or worse than a failure. In work of this kind the best is the cheapest, whatever it costs.

10. **How to vaccinate.**—In remote places it is sometimes necessary to vaccinate persons who are practically beyond the reach of a competent physician. For the benefit of such, and not as an encouragement to others to dispense with the services of a skillful physician, the following suggestions are made as to the best method of vaccinating. As a rule the most convenient place for vaccination is found to be on the outer surface of the left arm, about one-half or two-thirds the way up from the elbow to the shoulder. An infant which its mother carries on her right arm should be vaccinated on its right arm in order to avoid rupturing the vesicle by pressure against its mother. With a sharp pointed and perfectly clean instrument (lancet) make six parallel scratches, barely sufficient to make a show of blood, but not to cause bleeding. Directly across these scratches make four or five similar scratches, so that the scarified place shall be as large as a split pea, and something like this illustration:  If blood flows, wait, and wipe it off before applying the lymph. The virus is at and near the pointed end of the ivory carrier. Moisten the lymph upon the ivory point with half a drop of pure water, which has recently been boiled and cooled, smeared over it with

the lancet. Then *rub the point over the scarified surface briskly for a minute so as to lodge the granules in the abraded surface.* The lymph which may be deposited on the sound skin should be scraped upon the scarified place and allowed to dry there. When the arm is dry return its ordinary clothing, between which and the arm a loose, soft cloth should be fastened. Do not put on a tight bandage or any plaster. Let no saliva touch the scratched place, neither to affix a plaster nor in any way. Allow no water to touch the place unless it has been recently boiled. When an ivory point has been used throw it in the fire. Except there is urgent necessity, do not use the same point on two persons, and not then if there is danger of communicating disease. Vaccination sometimes fails because the arm is not well scarified and the virus is not thoroughly rubbed into the scarified surface. A skillful vaccinator can generally use sufficient care to insure success in a susceptible person. Never cut entirely through the skin. Virus should not be inserted under the skin. Except with young children, and with feeble persons, for whom only one place is recommended, two or more places an inch or more apart may be scarified and vaccinated.

11. **After vaccination.**—Let the vaccinated place alone. Do not scratch it or otherwise transfer the virus where it is not wanted.

12. **Common appearances after vaccination.**—For a day or two nothing unusual should appear. A few days after that, if it succeeds regularly, the skin will become red, then a pimple will form, and on the pimple a little vesicle or blister which may be plainly seen on the fifth or sixth day. On the eighth day the blister (vesicle) is, or should be, plump, round, translucent, pearly white, with a clearly marked edge and a depression in the center; the skin around it for about half an inch is red and swollen. This vesicle and the red inflamed *circle* about it (called the areola) are the two points which prove the vaccination to be successful. A rash, and even a vesicular eruption, sometimes comes on the child's body about the eighth day, and lasts about a week; he may be feverish, or may remain quite well. The arm may be red and swollen down as far as the elbow, and in the adult there will usually be a tender or swollen gland in the armpit, and some disturbance of sleep for several nights. The vesicle dries up in a few days more, and a crust forms which becomes of a brownish mahogany color, and falls off from the twentieth to the twenty-fifth day. In some cases the several appearances described above may be delayed a day or two. The crust or scab will leave a well-marked, permanent scar.

13. **Signs of successful revaccination.**—When a person who has been once successfully vaccinated is afterwards revaccinated there sometimes results a vesicle which, as regards its course and that of the attendant areola, cannot be distinguished from the perfect results of a primary vaccination, and this is more likely to occur if bovine virus is used. But often the result is modified by the influence of the previous vaccination, no true vesicle forms, but merely a papular elevation surrounded by an areola; and this result having attained its maximum on or before the fifth day, afterwards quickly declines. Or, if a vesicle forms, its shape is apt to vary from that of the regular vesicle, and its course to be more rapid, so that its maturity is reached on or before the sixth day, its areola declines on or before the eighth day, and the scabbing begins correspondingly early. In either case the areola tends to diffuse itself more widely and less regularly, and with more affection of the areolar tissue than in primary vaccination, while the itching and feverishness may

be present much the same as in primary vaccination. When the results of a revaccination are not well marked, protection should not be presumed unless the same virus is proved to be efficient in a primary vaccination.

14. **What to do during and after vaccination**—Do nothing to irritate the eruption, do not pull the scab off, when it drops off throw it in the fire. When the eruption is at its hight show it to the doctor who performed the vaccination. If it is satisfactory, ask him for a certificate stating when and by whom you were vaccinated, whether with bovine or humanized lymph, in how many places and with what result at each place. When the arm is healed, if the vaccination did not work *well, be vaccinated again as soon as possible,* and in the best manner possible. This will be a test of the protection secured by the former vaccination, and will itself afford increased protection. Do not be satisfied with less than four genuine vaccine scars, or with four if it is possible to secure more than four. This vaccination a second or third time in close succession is believed to be hardly less important than vaccination the first time, and hardly less valuable as a protection against small-pox. Without doubt many persons are living in a false sense of security from small-pox because at some time in their lives they have had a little sore on their arms caused by a supposed or a real vaccination, or because an imperfect vaccination failed to "work," or because they were successfully vaccinated, or had the varioloid, or the unmodified small-pox many years ago. Until small-pox is stamped out throughout the world so that exposure to the disease shall be practically impossible, the only personal safety is in such perfect and frequent vaccination that one need not fear an exposure to small-pox through the recklessness of the foolish. Statistics abundantly prove that among the unvaccinated, small-pox has lost none of the deadly power which made it such a terror to former generations.

15. **Make a record of your vaccination.**—Do not fail to procure and preserve the certificate mentioned in the preceding paragraph, and also to make a personal record of the facts with regard to any vaccination of yourself or in your family. From it you may sometime learn that it is ten years since you or some member of your family was vaccinated, when you thought it only five.

16. **Vaccination before admission to the schools.**—In some places, and with good results, the board of education has made the possession of a certificate signed by some competent physician, stating that the child has been successfully vaccinated within a given number of years or months, a condition to admission to the public schools. Such a regulation seems to be one of the most efficient means of securing a general vaccination of the young people.

17. **Corporations and large business firms** may well prevent interruption of their business by small-pox by requiring employees to exhibit certificates of successful vaccination, and of revaccination.

18. **Do not delay to be vaccinated.**—By setting about it at once there will be time to secure pure and fresh vaccine virus, and neither sickness nor haste need prevent a successful vaccination. But if one puts it off, he may suddenly be called away on an unexpected journey in which he may incur greater risk of exposure to small-pox, or small-pox may appear in his vicinity and for want of time to procure reliable vaccine virus he may be compelled to accept vaccination with virus neither fresh and active nor of known purity; and vaccination with inferior virus, while it affords but little protection against small-pox, may be a hindrance to successful vaccination with

the best virus; or by his delay he may contract small-pox itself, with all its dangers and with an expense many times larger than the cost of thorough vaccination.

19. **Small-pox occurs** at all seasons of the year, but as a rule is most prevalent in cold weather. It has been suggested that this may be in part due to a lack of ventilation in winter, by which the poison becomes more concentrated, and to the greater irritation and rawness of the throat and air-passages caused by the cold, dry air and by the more abundant ozone in winter, the sore throat supplying a place where small-pox may easily be inoculated; it is known also that in a warm, moist air vaccine virus decomposes more readily than in a cold, dry air, and the same is probably true of small-pox virus. This greater liability to small-pox in winter makes it important that one should not wait till winter and its dangers have come before being vaccinated, and also that he should not suffer the winter to pass without being vaccinated.

20. **Small-pox not spontaneously generated.**—It is believed that neither small-pox nor any other strictly contagious disease is originated in Michigan, and that small-pox may in great part be kept out of the State if proper measures are taken, such as the systematic inspection of immigrants and travelers and the isolation and disinfection of all infected material.

21. **Premises.**—Privies, cesspools, waterclosets, drains, gutters, and all other such places liable to receive the contagium of a disease should be frequently and liberally treated with the copperas solution mentioned in paragraph 9, on a page preceding this.

22. **Rags**—No person should handle old clothing or rags without taking precautions to prevent the spread of communicable diseases. Children should not be allowed to go near a rag-gatherer's collection, nor into the rag-rooms in paper-mills or store-house.

RESTRICTION OF SMALL-POX.

When small-pox appears in a place it is generally possible to restrict it to the first case or set of cases. Five things (specified in paragraphs numbered 23, 24, 25, 26 and 27) should immediately be done, and several other things should without fail be done in their proper order, somewhat as follows:

23. **Notice to the local board of health.**—The householder within whose family a case of small-pox occurs, and the physician called to treat a case of small-pox should at once give notice thereof to the health officer (or to the local board of health), as required in townships by section 1734 and 1735 of the compiled laws of 1871 (§§1675 and 1676 Howell's Statutes), and in cities and villages by section 1740 of the compiled laws of 1871, as amended in 1879 (§1681 Howell's Statutes), printed in paragraph 56, on a following page.

Section 1734 and 1735, C. L. 1871 (§§1675 and 1676, Howell's Statutes), as amended by Act 11, Laws of 1883, and the section (50) added in 1883, are as follows:

(1734). SEC. 43. Whenever any **householder, hotelkeeper, keeper of a boarding house or tenant** shall know, or shall be informed by a physician, or shall have reason to believe, that any person in his family, hotel, boarding house, or premises is taken sick with small-pox, cholera, diphtheria, scarlet fever, or any other disease dangerous to the public health, he shall immediately give notice thereof to the health officer, the president or the clerk of the Board of Health of the township, city, or village in which he resides. Said notice shall state the name of the person sick, the name of the disease, the name of the householder, hotelkeeper, keeper of boarding house, or tenant giving the notice, and shall, by street and number, or otherwise, sufficiently designate the house in which he resides or the room in which the sick person may be; and if he shall refuse or neglect immediately to give such notice he shall forfeit for each such offense a sum not exceeding one hundred dollars*: *Provided*, That this penalty shall not be enforced if a physician in attendance has given to the health officer or other officer hereinbefore mentioned an immediate notice of said sick person, and true name of the disease, in accordance with the requirements of this section. §1675, Howell's Statutes, as amended by Act 11, Laws of 1883.

(1735.) SEC. 44. Whenever any **physician** shall know that any person whom he is called to visit, or who is brought to him for examination, is infected with small-pox, cholera, diphtheria, scarlet fever, or any other disease dangerous to the public health, he shall immediately give notice thereof to the health officer, the president or the clerk of the board of health of the township, city, or village in which the sick person may be; and to the householder, hotel keeper, keeper of boarding house, or tenant within whose house or rooms the sick person may be. The notice to the officer of the board of health shall state the name of the disease, the name, age, and sex of the person sick, also the name of the physician giving the notice; and shall, by street and number, or otherwise, sufficiently designate the house or room in which said sick person may be. And every physician and person acting as a physician, who shall refuse or neglect immediately to give such notice shall forfeit for each such offense a sum not less than fifty nor more than one hundred dollars*: *Provided*, That this penalty shall not be enforced against a physician if another physician in attendance has given to the health officer, or other officer hereinbefore mentioned, an immediate notice of said sick person, and the true name of the disease, in accordance with the requirements of this section. §1676 Howell's, as amended by Act 11, Laws of 1883.

SEC. 50. For each complete notice in writing to an officer of the board of health, in full compliance with the preceding section, requiring from physicians or other persons notices of diseases dangerous to the public health, the physician who gave the notice shall be entitled, on duly certifying that each notice was correct, and when the bill has been duly audited by the board of health, to receive from the township, city or village in which the notice was given, the sum of ten cents.—Act 11, Laws of 1883.

24. **Upon receipt of such notice, the health officer and the local board of health has duties to perform** in taking measures to restrict the spread of the disease, which it is a great violation of public trust for him or for the board to neglect or postpone. The law is very plain as to the nature and the importance of these duties. Three sections of the law are as follows:

Notice of infected places.

(1732) SEC. 41. When the small-pox *or any other disease dangerous to the public health*, is found to exist in any township, *the Board of Health shall use all possible care to prevent the spreading of the infection*, and to *give public notice of infected places* to travelers, by such means as in their judgment shall be most effectual for the common safety.—(§1673 Howell's Annotated Statutes.)

Board to make provision to prevent spread of disease.

At expense of person or county. 3 Mich. Rep. 475. 51 Mich. p. 526. 58 Mich. p. 454. N. W. Reporter, Vol. 16, p. 887.

(1706) SEC. 15. When any person coming from abroad or residing in any township within this State, shall be infected, or shall lately before have been infected, with the small-pox, *or other sickness dangerous to the public health*, the Board of Health of the township where such person may be shall make effectual provision in the manner in which they shall judge best for the safety of the inhabitants, by removing such sick or infected person to a separate house, if it can be done without danger to his health, and by providing nurses and other assistance and necessaries, which shall be at the charge of the person himself, his parents, or other person who may be liable for his support, if able; otherwise, at the charge of the county to which he belongs.—(§1647 Howell's Annotated Statutes.)

Provision in case infected persons cannot be removed.

(1707.) SEC. 16. If any such infected person cannot be removed without danger to his health, the Board of Health shall make provision for him as directed in the preceding section, in the house in which he may be, and in such case they may cause the persons in the neighborhood to be removed, and may take such other measures as they may deem necessary for the safety of the inhabitants.—(§1648 Howell's Annotated Statutes.)

---

*__Supervisors__ must prosecute for all such forfeitures; township officers must give notice to supervisor; prosecuting attorney to conduct suit if requested: see sections 8439, 8440, and 8442, Howell's Annotated Statutes. **Health officers of villages and cities** must notify prosecuting attorney of all violations of this section,—see §1684, Howell's Statutes; the **prosecuting attorney** must prosecute for all such forfeitures incurred within his county,—see section 8442, Howell's statutes. Sections 8439 and 8440 are printed on page 2 of this circular.

25. **Duty of the health officer.**—As so much depends upon prompt action on the appearance of the first case of small-pox, and in order that no time may be lost, it is the duty of every board of health to make provision for prompt action by its health officer, authorizing and directing him to be prepared at all times, as executive officer of the board, to take certain action without waiting for a meeting of the board, whenever a case of small-pox or other disease dangerous to the public health occurs within its jurisdiction. Some of the duties which the health officer should perform are specified in Act No. 137, laws of 1883, as follows:

AN ACT to specify certain duties of health officers and provide for compensation therefor, in townships, cities and villages where the health officer is not otherwise instructed by the local board of health.

Powers and duties of health officers in reference to diseases dangerous to public health.

SECTION 1. *The People of the State of Michigan enact,* That whenever the health officer of any township, city or village in this State shall receive reliable notice or shall otherwise have good reason to believe that there is within the township, city or village of which he is the health officer, a case of small-pox, diphtheria, scarlet fever, or other communicable disease dangerous to the public health, it shall be the duty of said health officer, unless he is or shall have been instructed by the board of health, of which he is an executive officer, to do otherwise,—

Immediately to investigate the subject, and in behalf of the board of health, of which he is an executive officer,—

To order the prompt and thorough isolation of those sick or infected with such disease, so long as there is danger of their communicating the disease to other persons;—

To order the prompt vaccination or isolation of persons who have been exposed to small-pox;—

To see that no person suffers for lack of nurses or other necessaries because of isolation for the public good;—

To give public notice of infected places* by placard on the premises, and otherwise if necessary;

To promptly notify teachers or superintendents of schools concerning families in which are contagious diseases;

To supervise funerals of persons dead from scarlet fever, diphtheria, small-pox, or other communicable disease which endangers the public health;—

To disinfect rooms, clothing, and premises, and all articles likely to be infected, before allowing their use by persons other than those in isolation;

To keep the President of his own board of health, and the Secretary of the State Board of Health constantly informed respecting every outbreak of a disease dangerous to the public health, and of the facts so far as the same shall come to his knowledge, respecting sources of danger of any such diseased person or infected article being brought into or taken out of the township, city, or village of which he is the health officer.

Provisions to have force of regulations of local boards of health in certain cases.

Penalty for violation of provisions.

SEC. 2. In the absence of regulations conflicting therewith, made and published by the local board of health, and still remaining in force, the provisions of section one of this act shall have the force of regulations made and published by the local board of health; and whoever shall violate the provisions of section one of this act, or the orders of the health officer made in accordance therewith, shall forfeit for each such offense a sum not exceeding one hundred dollars.

Compensation of health officer.

Proviso.

SEC. 3. In the fulfillment of the requirements of this act, the health officer, unless other provision shall have been made in accordance with law, shall be entitled to receive from the township, city or village of which he is health officer, compensation at the rate of not less than two (2) dollars per day: *Provided,* That this section shall not be construed to conflict with any action by the local board of health, under section sixteen hundred and ninety-three, of the compiled laws of eighteen hundred and seventy-one, as amended by act number two hundred and two, of the laws of eighteen hundred and eighty-one.

Notice of infected places.

*Required by section 1732, compiled laws of 1871 (§1673, Howell's), as follows:—
(1732.) SEC. 41. When the small-pox, *or any other disease dangerous to the public health,* is found to exist in any township, *the board of health shall use all possible care to prevent the spreading of the infection,* and to *give public notice of infected places* to travelers, by such means as in their judgment shall be most effectual for the common safety. §1673, Howell's Statutes.

26. **Vaccination of attendants and all exposed.**—The attendants on the sick with small-pox and all other persons who it is feared have been exposed to small-pox or varioloid, should immediately be vaccinated. If properly vaccinated within a day or two after exposure to small-pox, a person has a good chance to escape small-pox entirely, and if he should come down with varioloid or modified small-pox he will probably have the disease in a much milder form than if not recently vaccinated. (See paragraph 5,—Prevention of small-pox.) Unless the eruption has already appeared, vaccinate.

27. **Restriction of the infection.**—As the contagium of small-pox harbors in carpets, bedding, clothing, etc., it is best to prepare the room in which one sick with small-pox is to be cared for, removing the carpets, pictures, sofas, etc., the bedding and clothing not required for actual use in the room, and any other articles capable of harboring the infection and which it would be difficult to disinfect or not desirable to burn. Such removals of carpets, bedding, etc., should not be attempted after they have been exposed to infection, unless properly disinfected under the direction of the health officer. (See paragraphs 12 and 15, on a preceding page of this document.)

28. **Isolation.**—Those sick with small-pox or suspected small-pox should at once be separated from all other persons except the necessary attendants on the sick.

29. **Care of those exposed to small-pox.**—All persons known to have been exposed to small-pox should at once be vaccinated, and should be, so far as possible, isolated from others until it is known whether they have contracted small-pox. This "period of incubation" is usually about 12 or 15 days.

30. **Notice of infected place.—Placard on house.**—A signboard or large card as a signal of danger, with the words SMALL-POX printed on it in large, plain letters should at once be displayed before a house, and a large card with the words SMALL-POX in large, plain letters should be fastened on the door of a house in which is a case of small-pox; and without permission of the health officer no person should be allowed to come to the house or go from it.

31. **Who may attend small-pox patients.**—Any person who has recently been successfully vaccinated or revaccinated, or has *recently* had small-pox or varioloid, may attend on small-pox patients with comparative safety to himself, and in most cases with absolute safety so far as relates to danger from small-pox. No person who has been vaccinated or has had varioloid or small-pox more than ten years previously should rely upon such experience for security from small-pox, if exposed by attendance on a person sick with small-pox or varioloid. Such a person should immediately be revaccinated.

"It is now fully established that a typical vaccine scar is not proof of the immunity of the individual from small-pox. We have admitted to the hospital * * * 711 cases of small-pox exhibiting typical cicatrices; of which number 73 proved fatal."—W. M. Welch, M. D., in Philadelphia Health Report, 1872.

There is good statistical support for the common theory that the protective influence of vaccination, varioloid and small-pox dies out in seven years. This is now known to be absolutely true for many persons, but there is no one period applicable to all persons, the fact being that while vaccination affords at first almost absolute protection, its influence is gradually worn out. Its protective influence is lost much sooner in some persons than in others, but experience has shown (as in Philadelphia in 1871-2) that many children vaccinated in infancy have varioloid before they are seven years of age, while in some instances one vaccination or one attack of small-pox protects the individual through life. Inasmuch as many persons are known to be susceptible to small-pox or vaccination as often as once in ten years, and as some are susceptible yet more frequently, this State Board of Health has advised revaccination every five years, as the most judicious measure for the prevention of small-pox.

DISINFECTION.*

32. **Disposal of infected material.**—All discharges from a small-pox patient should be received into vessels containing a strong solution of copperas (sulphate of iron), or the zinc-solution mentioned in paragraph 34. In cities where sewers are in use the disinfected discharges may be thrown into the water-closet; in other places they should at once be buried at least 100 feet distant from any well; they should not by any means be thrown into a running stream nor into a cess-pool. All cloths, rags, etc., used about the patient should at once be burned, or where that is impracticable should be thrown into a strong zinc-solution. If necessary, discharges from the patient may be received on old cloths which should at once be burned or disinfected and buried. All vessels should be kept clean and disinfected.

Bedding, clothing, etc., should as soon as removed from the patient be burned. If it is too valuable to be destroyed, it should at once be disinfected by boiling in the zinc-solution, by heating in a specially prepared disinfecting chamber to a temperature of 250° Fahr., or by long exposure in a close room or box to the fumes of burning sulphur, as stated in paragraph 36, following.

Cotton, linen, flannels, blankets, etc., should be treated with the boiling hot zinc-solution, introducing them piece by piece, securing thorough wetting, and boiling for at least half an hour.

Heavy woolen clothing, silks, furs, stuffed bed-covers, beds, and other articles which cannot be treated with the zinc-solution, should be hung in the room during fumigation, pockets being turned inside out and the whole garment thoroughly exposed. Afterward they should be hung in the open air, beaten and shaken. Pillows, beds, stuffed mattresses, upholstered furniture, etc., should be cut open, the contents spread out and thoroughly fumigated. Carpets are best fumigated on the floor, but should afterward be removed to the open air and thoroughly beaten, after which they may well be again exposed to fumes of burning sulphur.

33. **The copperas-solution** may be prepared by dissolving sulphate of iron (copperas) in water in the proportion of one and a half pounds of copperas to a gallon of water. When much is wanted it may be prepared by hanging a basket containing about sixty pounds of copperas in a barrel of water.

34. **The zinc-solution** may be prepared by dissolving sulphate of zinc and common salt in water in the proportion of four ounces of zinc-sulphate and two ounces of salt to a gallon of water.

35. **Care of rooms, etc., during sickness.**—So far as consistent with the welfare of the patient, the room throughout the sickness should be constantly ventilated and frequently aired. To confine the poison in a close room is to retain its power of infecting others. It is well to provide for disinfecting the foul air withdrawn from the room, as by an open fire-place where this is

---

* These methods of disinfection are applicable in other contagious diseases such as scarlet fever, diphtheria, etc. For the statement of some of the methods herein described the State Board of Health is indebted to a circular on disinfection (No. 8) issued by the National Board of Health.

practicable, or by flues leading into furnaces, or kept constantly fumigated in some manner. It is well to keep in the sick-room a vessel containing the zinc-solution (mentioned in a preceding paragraph) for the reception of towels, sheets, and other articles of clothing which are not to be burned or disinfected in a specially prepared oven.

36. **Disinfection after death, recovery, or removal.**—After death, recovery, or removal there should take place, under the supervision of the health officer, the most thorough and complete disinfection of the house and the contents of the house in which there has been a case of small-pox. It is far better for the community and cheaper for the board of health to pay a competent man to see that this is properly done than to take the risk of its not being done well. This disinfection should be done with fumes of burning sulphur. For this purpose the room to be disinfected must be vacated. Heavy clothing, blankets, bedding, and other articles which cannot be treated with zinc-solution, should be opened and spread out so as to be freely exposed during fumigation. Close the doors and all large openings to the room as tight as possible, but do not use paste, or in any such way cover surfaces which need to be disinfected, nor prevent free entrance of the fumes to all cracks into which the contagium may have entered. Place the sulphur in iron pans supported upon bricks, set it on fire by hot coals or with the aid of a spoonful of alcohol and a lighted match, and allow the rooms to remain closed for several hours. For a room about ten feet square, three pounds of sulphur should be burned; for a larger room a proportionally larger quantity should be used, that is at the rate of three pounds of sulphur to each one thousand cubic feet of air-space.

37. **Carefully avoid breathing the fumes of the burning sulphur.**—After fumigation for several hours, the room should be thoroughly opened and aired, before it is again occupied.

38. **Care of the corpse.**—The corpse should be wrapped in a sheet wet with a zinc-solution of double the strength specified in paragraph 10, preceding and buried at once. Metallic, metal-lined, or air-tight coffins should be used when possible, certainly when the body is to be transported for any considerable distance. In no case should the body be exposed to view except in a perfectly air-tight coffin, and through glass; the coffin after its final closure having been exposed to fumes of burning sulphur of the strength specified above.

39. **Disinfection of rooms, clothing, etc., incidentally exposed to infection.**—Hotel-rooms, stores,* cars, boats, hacks or other inclosures which may have been exposed to infection should be carefully disinfected by fumes of burning sulphur, as specified in paragraph 36.

40. **Funerals.**—No public funeral should be held at the house, and no one should go to a public funeral from the house where one has died from small-pox, or the inmates have been exposed to the disease. Should any one from an infected or exposed house ride to a funeral or a grave in a public hack, the robes, cushions, etc., and the interior of the hack should immediately afterwards be thoroughly disinfected by exposure for several hours to the fumes of burning sulphur, as described in paragraph 36.

---

* Prof. Richardson, of Philadelphia says:—(Germ Theory of disease, *Trans. Phila. Social Science Association, Penn Monthly, Nov., 1878.*) Some years ago cases of small-pox occurred in the house of a dealer in ready-made clothing near New York. The whole stock of coats, pantaloons, etc., numbering many hundreds, had an opportunity to become infected and should have been carefully disinfected. They were, however, sold at retail, and may have given rise to many cases of "idiopathic" small-pox which no one could trace to any source of contagion.

41. **Care of convalescents.**—After recovery the patient should not be allowed to go abroad or to receive visitors until his clothing, etc., has been carefully disinfected under the supervision of the health officer, and until he has received from the health officer or from some competent physician a properly authenticated statement which is approved by the health officer that there is no longer any danger of his communicating the disease.

42. **Hospitals for persons sick with diseases dangerous to the public health.**—As a means of preventing the spread of disease, the law authorizes the inhabitants of townships, cities, and villages to be constantly provided with hospitals for the reception of persons having small-pox, or any other disease dangerous to the public health; and directs local boards of health on the outbreak of any such disease to provide such hospitals or places of reception for the sick and infected as they shall judge best for their accommodation and the safety of the inhabitants, and to cause such sick or infected persons, if their condition will admit, to be removed to such hospitals or places of reception,—said hospitals, and (in case the sick cannot be removed to the hospital without danger to life or health) the houses where the sick may remain, and all persons connected with said hospitals or abodes of the sick to be subject to the regulations of the board of health, or of a committee appointed by the board of health for that purpose. Sections 1726-1733 of the Compiled Laws of 1871, (§1667-1674, Howell's Statutes) relating to this subject, and by amended section 1740 * (§1681 Howell's Statutes), (being Secs. 35-42, and 49 of chapter XLVI.) made equally applicable to cities, villages, and townships, are as follows:

Hospitals for reception of persons having small-pox, etc.

(1726.) SEC. 35. The inhabitants of any township may establish within their township and be constantly provided with one or more hospitals for the reception of persons having the small-pox, or other disease which may be dangerous to the public health.—*§ 1667, Howell's Statutes.*

By whom hospitals to be regulated, etc.

(1727.) SEC. 36. All such hospitals shall be subject to the orders and regulations of the board of health, or a committee appointed by such board for that purpose; but no such hospital shall be established within one hundred rods of any inhabited dwelling-house situated in an adjoining township, without the consent of such adjoining township.—*§ 1668, Howell's Statutes.*

Penalty for inoculating with small-pox, except at hospitals.

(1728) SEC. 37. If any person shall inoculate any other person, or inoculate himself, or suffer himself to be inoculated with the small-pox, unless at some hospital licensed and authorized by law, he shall for each offense, forfeit a sum not exceeding two hundred dollars.—*§ 1669, Howell's Statutes.*

Physicians, etc., to be subject to regulations of board, etc.

(1729.) SEC. 38. When any hospital shall be so established, the physician attending the same, the persons inoculated or sick therein, the nurses, attendants, and all persons who shall approach or come within the limits of the same, and all such furniture and other articles as shall be used or brought there shall be subject to such regulations as shall be made by the board of health, or of the committee appointed for that purpose.—*§ 1670, Howell's Statutes.*

When board of health to provide hospital.

(1730.) SEC. 39. When the small-pox or any other disease dangerous to the public health shall break out in any township, the board of health shall immediately provide such hospital, or place of reception for the sick and infected, as they shall judge best for their accommodation and the safety of the inhabitants; and such hospitals and places of reception shall be subject to the regulations of the board of health, in the same manner as herein provided for established hospitals.—*§ 1671 Howell's Statutes.*

Penalty for violating regulations of hospitals.

(1733.) SEC. 42. If any physician or other person in any of the hospitals or places of reception before mentioned, or who shall attend, approach, or be concerned with the same, shall violate any of the regulations lawfully made in relation thereto, either with respect to himself, or his or any other person's property, the person so offending shall, for each offense, forfeit a sum not less than ten nor more than one hundred dollars. §1674, Howell's Statutes.

---

* Printed on page 220 of this article.

43. **Hospital construction, ventilation, warming, etc.**—In the construction and management of hospitals great care should be had for the comfort, safety, and health of those confined in or connected with them, as well as for the safety of the public.

The proper size and plan for such a hospital may vary somewhat for different localities; but a few general principles which should be considered may be mentioned here. Particular attention should be paid to ventilation. The foul air should be drawn off through an opening or openings in the floor or in the wall at the floor-level, into a *heated* flue open at the top. In cold weather the fresh air should be warmed before it enters, or as it enters the room. This may be done by a furnace or by steam coils in fresh air ducts. If stoves are used this can be done by jacketing the stove and providing an inlet pipe for fresh air from out door to the back of the stove within sheet-iron jacket, as described on pages 55-62 of the Report of the State Board of Health for 1879, and on pages 263-6 of the Report for 1880.

44. **Removal of sick or infected persons.**—The law provides that the board of health "shall make effectual provision in the manner in which they shall judge best for the safety of the inhabitants," sections 1706, 1731, and 1707, compiled laws of 1871 (§§1647, 1672, and 1648, Howell's Statutes), being as follows:—

> (1706.) SEC. 15. When any person coming from abroad or residing in any township within this State shall be infected, or shall lately before have been infected, with the small-pox, or other sickness dangerous to the public health, the board of health of the township where such person may be shall make effectual provision in the manner in which they shall judge best for the safety of the inhabitants, by removing such sick or infected person to a separate house, if it can be done without danger to his health, and by providing nurses and other assistance and necessaries, which shall be at the charge of the person himself, his parents, or other person who may be liable for his support, if able; otherwise, at the charge of the county to which he belongs. § 1647, Howell's Statutes.
>
> Board to make provision to prevent spread of small-pox, etc.
>
> 3 Mich. Rep. 475.
> 51 Mich. p. 526.
> 58 Mich. p. 454.
>
> (1731.) SEC. 40. The board of health shall cause such sick or infected persons to be removed to such hospitals or places of reception, unless the condition of the sick person be such as not to admit of removal without danger to life; in which case the house or place where the sick shall remain shall be considered as a hospital to every purpose before mentioned, and all persons residing in or in any way concerned with the same, shall be subject to the regulations of the board of health, as before provided. § 1672, Howell's Statutes.
>
> When infected persons to be removed to hospital, etc.
>
> (1707.) SEC. 16. If any such infected person cannot be removed without danger to his health, the board of health shall make provision for him as directed in the preceding section, in the house in which he may be, and in such case they may cause the persons in the neighborhood to be removed, and may take such other measures as they may deem necessary for the safety of the inhabitants. § 1648, Howell's.
>
> Provision in case infected persons cannot be removed.

45. **Nurses and necessary supplies.**—Persons thus restrained at hospital or at home should be permitted to provide themselves, or the local board of health should provide them with the best nursing and medical care. The duty of the board of health is not primarily to assume the care and medical treatment of the person sick with small-pox or other disease dangerous to the public health, but to place that care and treatment under such regulations as will protect the community from the spread of the disease; but persons thus restrained for the public good are generally prevented from earning their own support, and the public in thus enforcing unusual conditions is bound to provide proper care and medical treatment, food, etc., for those not able to provide for themselves. The board of health is authorized and required to "provide nurses and other assistance and necessaries," at the charge of the

person sick, or of those liable for his support, if able (in which case the person sick will choose his own medical attendants), otherwise at the charge of the county to which he belongs. This is provided for by sections 1706 and 1707, compiled laws of 1871, printed above. See also Third Michigan Report, page 475, in which the supreme court in 1855 granted a writ of mandamus to compel the board of supervisors of Macomb county to pay a claim for *care* of an indigent person sick with small-pox, which claim had been audited by, and was for services ordered by, the board of health of the village of Mt. Clemens. under section 1706 (§1647 Howell's Statutes), being section 15, of chapter XLVI of the revised statutes of 1846. See also 51st Michigan, page 527, where it is held that the city is immediately responsible, and that "in providing that what is done shall be at the charge of the individual, it is not intended to exempt the public from immediate liability." See also 58th Michigan, page 454, where it is held that the board of supervisors must pass such accounts and can be compelled by mandamus to do so, that they cannot refuse on the ground that the patients were themselves able to pay or that sundry taxpayers considered the charges exorbitant.

46. **Houses, supplies, nurses, etc., paid by the county in certain cases.**—Nurses and attendants employed by the sheriff or other officer in accordance with section 1709 (§1650 Howell's Statutes), owners of houses, stores, lodgings, or other necessaries taken possession of by either of said officers in accordance with sections 1709-1712 (§1650-1653 Howell's Statutes), and other persons properly employed by said officers to assist in the duties enjoined by said sections, are entitled to just compensation, to be paid by the county. This is provided by section 1714 (§1655, Howell's Statutes), as follows:

Compensation for houses, nurses, etc.

(1714) SEC. 23. Whenever the sheriff or other officer shall take possession of any houses, stores, lodgings, or other necessaries, or shall employ any nurse or attendants, as provided in this chapter, the several parties interested shall be entitled to a just compensation therefor, to be paid by the county in which such person or property shall have been so employed or taken possession of.

47. **Duties of the local board of health.**—In view of known means of preventing and restricting small-pox, it would seem to be the duty of the local board of health:—

(I.) Frequently to place before the people the importance of vaccination, and to recommend general vaccination of all persons who have not been successfully vaccinated within the preceding five years. The board of health is authorized by Act No. 146 of the laws of 1879, to offer free vaccination. The law reads as follows:

Board of Health authorized to furnish vaccination.

SECTION 1. *The People of the State of Michigan enact*, That the board of health in each city, village and township may, at any time, direct its health officer or health physician to offer vaccination with bovine vaccine virus to every child not previously vaccinated, and to all other persons who have not been vaccinated within the preceding five years, without cost to the persons [person] vaccinated, but at the expense of such city, village or township, as the case may be.—§1685, Howell's Statutes.

(II.) To enforce the law (sections 1734 and 1735, compiled laws of 1871, pages 208–9 of this document), requiring householders and physicians to give immediate notice of cases of small-pox and other diseases dangerous to the public health. What it is the duty of the board of health to require the people to do for their own safety *it is the duty of the people* to do without compulsion. The board of health should have as prompt notice of the outbreak of a contagious disease as the fire department has of the outbreak of fire, and as hearty coöperation of citizens for the suppression of the disease as is given the fire department for the suppression of fire. And when the board is informed it should act as promptly, and continue to act as faithfully, as is done for the extinguishing of a fire.

(III.) To secure complete isolation of those sick or infected with small-pox.

(IV.) To give the public prompt and full notice of infected places (section 1732, compiled laws of 1871, printed below).

(V.) In general, and in compliance with the following section of law, to do all that may be done by prompt and intelligent action to prevent the introduction of disease.

(1732) SEC. 41. When the small-pox, *or any other disease dangerous to the public health*, is found to exist in any township [city or village*] *the board of health shall use all possible care to prevent the spreading of the infection*, and to *give public notice of infected places* to travelers, by such means as in their judgment shall be most effectual for the common safety.—§1673, Howell's Statutes.

Notice of infected places.

(VI) To secure and superintend the immediate and thorough disinfection of infected houses, material, etc., as directed in paragraphs 8–15, of this document.

(VII.) Promptly to notify, by its clerk or health officer, the State Board of Health upon the first outbreak of small-pox, or any other disease dangerous to the public health, in accordance with published requirements of the State Board of Health under section 8 of act No. 81, laws of 1873.

48. **The local board of health should make and publish regulations** to prevent the introduction of disease into or its spread within its locality.

(1695.) SEC. 4. The said board shall also make such regulations as they may deem necessary for the public health and safety, respecting any articles which are capable of containing or conveying any infection or contagion, or of creating any sickness, when such articles shall be brought into, or conveyed from, their township, or into or from any vessel; and if any person shall violate any such regulation, he shall forfeit a sum not exceeding one hundred dollars.—§1636, Howell's Statutes.

Respecting articles capable of conveying contagion, etc.

The foregoing section of law is a very important one; but it is useful only after action has been taken by the local board of health; therefore, every board of health should make and publish and constantly maintain regulations to prevent the introduction or movement of articles capable of "conveying infection or contagion." Such regulations should relate to:

(1.) Persons sick with a communicable disease. (2.) Bodies of persons dead of a communicable disease. (3.) Persons who have been with the dead or living bodies infected with a communicable disease, or in a room or place occupied by such a body. (4.) Baggage, clothing, food, drink, or other articles capable of conveying a communicable disease.

Such regulations may be in some such form as follows:

Regulations Relative to infectious Persons or Substances.

No person sick with cholera, small-pox, diphtheria, scarlet fever, or any other dangerous communicable disease; no corpse of a person dead from one of the above named diseases; or from any other dangerous communicable disease; and no article which has been infected or is liable to propagate or convey any such disease, shall be brought into or removed within this [township, city or village, as the case may be,] without the special permit and direction of the board of health thereof.

The foregoing regulations shall remain in force until revoked by the board of health of this [township, city or village.]

Whoever violates the foregoing regulations incurs the penalty of the law.

---

*This section is made to apply to cities and villages by section 1740, compiled laws of 1871, as amended by act No. 145, laws of 1879 (§1681, Howell's Statutes), printed on page 220 of this document.

Permits for the removal of infected persons or articles, in accordance with law, may be granted by this board, and by its health officer when the board is not in session, under circumstances and conditions as recommended by the State Board of Health.

Signed,

Members of the Board of
Health of the [township,
city, or village] of

Regulations should also be made and published relative to the restriction of communicable diseases at hospitals or houses where they may be. Sections 1667 to 1674, Howell's statutes, relate to this subject; some of them are printed on pages 214–215.

49. **Notices of regulations of local boards of health.**—Though a more general notice than is *required* by law should always be given of regulations made by local boards of health, the notice required by section 1698, compiled laws of 1871 (§ 1639, Howell's Statutes), should never be omitted, as on the giving of this notice might depend the success of legal proceedings begun by the board to enforce obedience to its regulations:

Notice of regulations, how published.

(1698.) SEC. 7. Notice shall be given by the board of health of all regulations made by them, by publishing the same in some newspaper of the township, if there be one published therein, and if not, then by posting them up in five public places in such township; and such notice of said regulations shall be deemed legal notice to all persons. § 1639, Howell's Statutes.

Section 1698 applies also to boards of health in cities and villages; and in general it should be remembered that by the amended section 1740 (§ 1681, Howell's Statutes,) the provisions of all sections in chapter 46 of the compiled laws of 1871, including sections 1692-1744 and the amendments thereto, apply so far as applicable with equal obligation to the inhabitants and the boards of health in cities and villages, unless charter provisions conflict. (See Sec. 1740 in paragraph 56, page 220 of this document.)

50. **Inspection of travelers, restraint of infected persons.**—Boards of health of townships, cities and villages near to or bordering upon neighboring States are by section 1708 (§1649, Howell's Statutes) (made applicable to cities and villages by Act 145, laws of 1879, printed on page 220 of this pamphlet) authorized to inspect travelers, and to restrain from travel within their jurisdiction, except by license from the board of health, persons coming from infected places in other States. Section 1708 is as follows:

Board may restrain travelers coming from infected districts.

(1708) SEC. 17. The board of health of any township* near to or bordering upon either of the neighboring States, may appoint, by writing under their hands, suitable persons to attend any places by which travelers may pass from infected places in other States; and the persons so appointed may examine such passengers as they may suspect of bringing with them any infection which may be dangerous to the public health, and, if need be, may restrain them from traveling until licensed thereto by the board of health of the township to which such persons may come; and any person coming from such infected place, who shall, without license as aforesaid, travel within this State, unless it be to travel by the most direct way to the State from whence he came, after he shall be cautioned to depart by the persons appointed as aforesaid, shall forfeit a sum not exceeding one hundred dollars.—§1649, Howell's Statutes.

51. **Permits for removal** of an infected article or sick person may be granted by the board of health in its discretion.

---

*Made applicable to cities and villages by Act 145, laws of 1879 (§1681, Howell's Statutes), printed on page 220 of this pamphlet.

Board may permit removal of infected articles, etc.

(1705.) SEC. 14. The board of health may grant permits for the removal of any nuisance, infected article, or sick person within the limits of their township, when they shall think it safe and proper so to do.—§1646, Howell's Statutes.

52. **Restraint and removal of infected persons.**—In case of travelers and other persons *infected* with any disease dangerous to the public health, the law (section 1706, compiled laws of 1871, in paragraph 20, page 12, of this document) requires the local board of health to make effectual provision for the safety of the inhabitants,—including removal of the sick person to another house when this is best and can be done without danger to the health of the person sick, otherwise at the house where he may be.

In removing and caring for any person infected with contagious sickness the board of health may make use of the sheriff or any constable of the county, by procuring a warrant signed by any two justices of the peace. Section 1709 permits this, and is as follows:

Removal of persons infected.

(1709.) SEC. 18. Any two justices of the peace may, if need be, make out a warrant under their hands, directed to the sheriff or any constable of the county, requiring him, under the direction of the board of health, to remove any person infected with contagious sickness, or to take possession of convenient houses and lodgings, and to provide nurses, attendants, and other necessaries for the accommodation, safety, and relief of the sick.—§1650, Howell's Statutes.

53. **Control of infected baggage, clothing, goods, etc.**—By sections 1710–1713 the board of health is authorized to procure the detention, examination, and purification at the owner's expense of any baggage, clothing or goods of any kind, found within the township, city or village, which there is just cause to suspect to be infected with any disease dangerous to the public health. These sections are as follows:

Infected baggage, clothing, and goods, how secured.

(1710.) SEC. 19. Whenever, on application of the board of health, it shall be made to appear to any justice of the peace that there is just cause to suspect that any baggage, clothing or goods of any kind found within the township are infected with any disease which may be dangerous to the public health, such justice of the peace shall, by warrant under his hand, directed to the sheriff or any constable of the county, require him to take with him as many men as the said justice shall deem necessary to secure such baggage, clothing, or other goods, and to post said men as a guard over the house or place where such baggage, clothing, or other goods shall be lodged, which guard shall take effectual care to prevent any person removing or coming near to such baggage, clothing, or other goods, until due inquiry be made into the circumstances thereof.—§1651, Howell's Statutes.

Impressing houses, etc., for keeping infected goods.

(1711.) SEC. 20. The said justice may also, by the same warrant, if it shall appear to him necessary, require the said officer, under the direction of the board of health, to impress and take up convenient houses or stores for the safe keeping of such baggage, clothing, or other goods; and the board of health may cause them to be removed to such houses or stores, or to be otherwise detained, until they shall, in the opinion of said board of health, be freed from infection.—§1652, Howell's Statutes.

Power of officer executing warrant.

(1712) SEC. 21. Such officer in the execution of such warrant, shall, if need be, break open any house, shop, or any other place mentioned in said warrant, where such baggage, clothing, or other goods shall be; and he may require such aid as shall be necessary to effect the execution of the warrant; and all persons shall, at the command of any such officer, under a penalty not exceeding ten dollars, assist in the execution of the warrant, if able to do so. § 1653 Howell's Statutes.

Charges to be paid by owner.

(1713.) SEC. 22 The charges of securing such baggage, clothing or other goods, and of transporting and purifying the same, shall be paid by the owners thereof, at such rates and prices as shall he determined by the board of health. § 1654, Howell's Statutes.

54. **Small-pox in a jail.**—The board of health may by written order secure the removal from a common jail to a hospital or other place of safety of a prisoner attacked with a disease dangerous to the safety and health of the other prisoners or of the inhabitants of the township, city or village. Sec-

tions 1715 and 1716 authorizing and prescribing the manner of such removal are as follows:

When prisoners attacked with dangerous disease may be removed.

(1715.) Sec. 24. Whenever any person confined in any common jail shall be attacked with any disease, which, in the opinion of the physician of the board of health, or of such other physicians as they may consult, shall be considered dangerous to the safety and health of the other prisoners, or of the inhabitants of the township, the board of health shall, by their order in writing, direct the removal of such person to some hospital or other place of safety, there to be provided for and securely kept, so as to prevent his escape, until their further orders; and if such prisoner shall recover from the disease, he shall be returned to such jail. § 1656, Howell's Statutes.

Prisoners removed to be returned, and not to be considered as having escaped.

(1716.) Sec. 25. If the person so removed shall have been committed by order of any court, or under any judicial process, the order for his removal, or a copy thereof, attested by the presiding member of said board of health, shall be returned by him, with the doings thereon, into the office of the clerk of the circuit court for the county; and no prisoner, removed as aforesaid, shall be considerod as thereby having committed an escape. § 1657, Howell's Statutes.

55. **Small-pox in a poorhouse.**—On the outbreak in a county poorhouse or in the vicinity thereof of any pestilence or contagious disease likely to endanger the health of persons supported at the poorhouse, the superintendents are by section 1717 required to remove to some other suitable place any or all of the persons there supported until they can safely be returned or otherwise be discharged. Section 1717 is as follows:

When superintendents of poor may remove paupers from poorhouses.

(1717.) Sec. 26. Whenever any pestilence or contagious disease shall break out in any county poorhouse in this State, or in the vicinity thereof, and the physician to such county poorhouse, or such other physician as the superintendents may consult, shall certify that such pestilence or disease is likely to endanger the health of the persons supported at such poorhouse, the superintendents of such county poorhouse shall cause the persons there supported, or any of them, to be removed to some other suitable place in the same county, there to be maintained and provided for at the expense of the county, with all necessary medical attendance and care, until they can safely be returned to such poorhouse, or otherwise discharged. § 1658 Howell's Statutes.

56. Boards of Health in cities and villages. Certain Laws *relative to townships are made applicable to cities and villages:—

Section 1740, as amended by Act No. 145, laws of 1879 (§1681, Howell's Statutes) is as follows:

Board of Health in cities and villages, who to constitute.

(1740.) Sec. 49. The mayor and aldermen of each incorporated city, and the president and council, or trustees of each incorporated village in this State, in which no board of health is organized under its charter, shall have and exercise all the powers and perform all the duties of a board of health as provided in this chapter, within the limits of the cities or villages, respectively, of which they are such officers. The provisions of this chapter [*] and the amendments thereto, shall, as far as applicable, apply to all cities and villages in this State, and all duties which are, by the provisions of this chapter [*] to be performed by the board of health of townships, or by the officers and inhabitants thereof, shall in like manner be performed by the board of health and the officers and inhabitants of such cities and villages, with a like penalty for the non-performance of such duties, excepting in cases where the charters of such cities and villages contain provisions inconsistent herewith.

Duties of officers and inhabitants of cities and villages.

*Chapter 46 of the Compiled Laws of 1871.

In July, 1877, the Michigan State Board of Health passed a resolution advising and requesting all boards of health to offer every year free vaccination with bovine virus to every child not previously vaccinated and to all other persons not vaccinated within five years. The resolution was then, and has since been widely distributed throughout the State. Act 146, Laws of 1879 embodied this recommendation in law.

October 23, 1888, the State Board, by resolution, requested the boards of health of all the cities, villages, and townships in Michigan "to recommend the vaccination of all unprotected persons within their jurisdictions." A circular to this effect was sent to every health officer in Michigan.

This tract is a revised edition of the document issued by this Board in 1882. It more fully sets forth the importance of vaccination, and other means for the prevention and restriction of small-pox.

It is hoped that local boards of health, newspapers, and all public-spirited persons will aid in spreading the information herein contained.

Since the State Board of Health was established, many thousands of people in Michigan have been vaccinated because of its recommendations; and the statistics of deaths, published by the Secretary of State, show that at the close of the year 1884 the death-rate from small-pox in Michigan had been so much less than before the Board was established as to indicate that over one thousand lives had then been saved from that loathsome disease. We have now (at the close of 1888) added to that record four more years of comparative freedom from small-pox, which means a further saving of human life, due, it is believed, to the preventive measures—vaccination and revaccination, and the increased efficiency of local boards of health in restricting the disease.

A copy of this document may be obtained by any person in Michigan by addressing the Secretary of the State Board of Health, Lansing, Michigan.

COMMUNICABLE DISEASES IN MICHIGAN DURING THE YEAR ENDING DECEMBER 31, 1887.

COMPILED UNDER THE DIRECTION OF THE SECRETARY OF THE STATE BOARD OF HEALTH.

This paper continues a subject treated for the preceding year on pages 227-282 of the Report of the State Board of Health for the year 1885, and for former years in the Reports for those years respectively.

Whenever information is received at this office of the outbreak in any locality in Michigan of diphtheria, scarlet fever, typhoid fever, small-pox, measles, whooping-cough, or glanders, a letter is sent to the health officer of the township, city, or village in which the disease is present (if the name of the health officer has been reported to this office; if not, to the president of the Board of Health), calling his attention (if the report was not received from him) to the existence of the disease within his territory, indicating his duties and powers and proper measures to be taken in restricting the disease, transmitting documents of instruction with regard to prevention and restriction of the disease, for distribution among families especially exposed to it,* and asking for a report of the methods employed for the restriction of the disease, and the results of efforts for suppressing it—and the number of cases and deaths in each outbreak. Except in the cases of measles, whooping-cough and glanders, for which a special form of letter was employed, the form of the letter generally sent during the year 1886 was substantially the same as that printed on pages 251-252 of the Report of the State Board of Health for the year 1884. With this letter was sent a blank form (L) for notice of the first case of a dangerous communicable disease, a blank form (M) for weekly reports during the continuance of the disease, and the blank form (K) for special final report. These now in use are substantially the same as those printed on pages 253-254 of the Report for 1884. The blank (K) for final report is printed on pages xiii.-xiv. of this Report.

The large number of replies received in answer to communications in regard to contagious disease, the general desire manifested by health officers for documents on the restriction of communicable diseases, and the general care taken to send complete reports to this office, show an increasing interest among the people, and a commendable effort on the part of the local health authorities to have every means employed to prevent the spread of contagious disease.

---

* It is believed that these documents distributed in this manner are doing great good; for the neighbors of the sick are sufficiently alarmed to read the documents, and are thus led to co-operate in stamping out the disease.

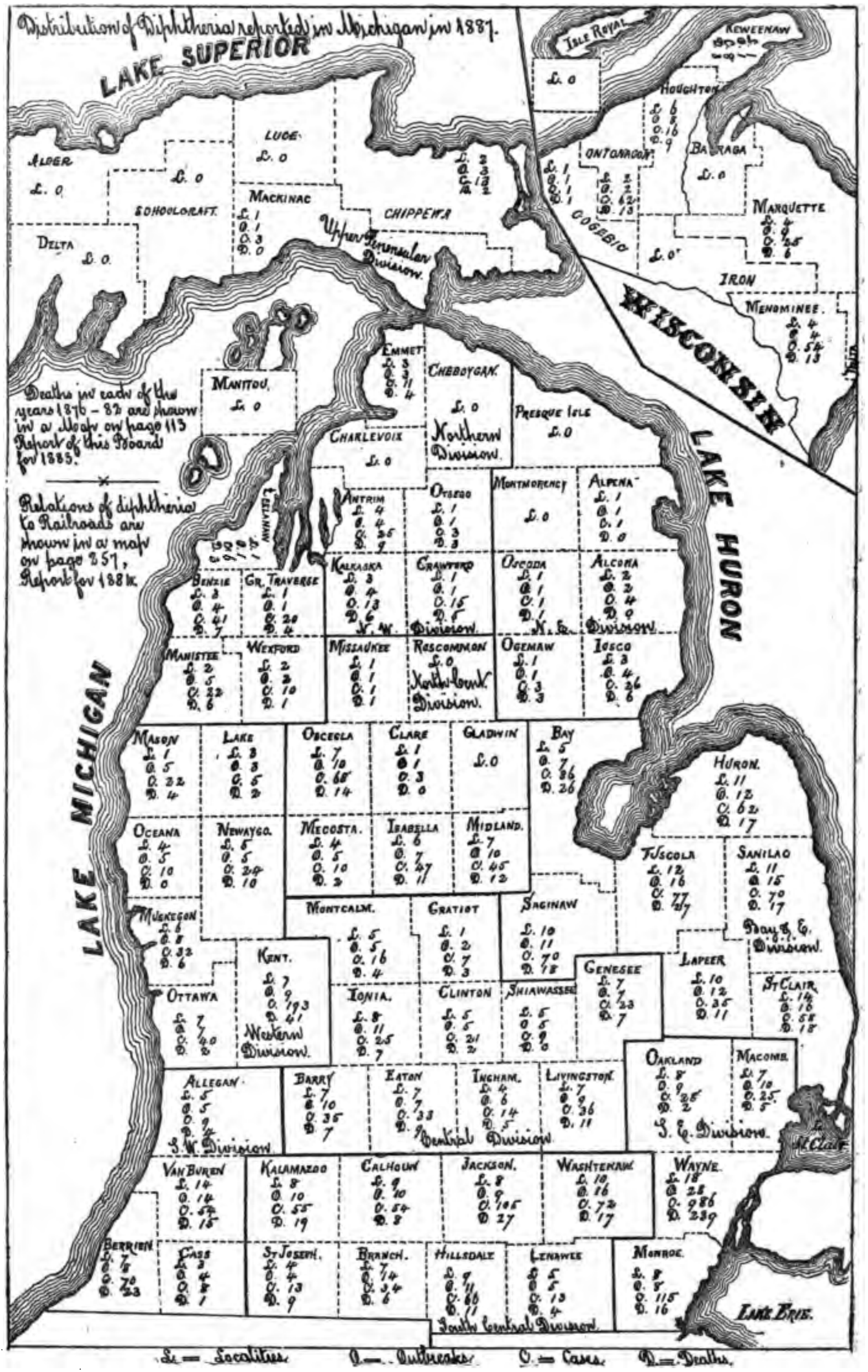
Some evidence of the value of this work may be seen further on in this article, under the heads of "Practical Results in Restricting Diphtheria," and "Practical Results in Restricting Scarlet Fever.

TABLE.—*Number of Places in Michigan at which Communicable Diseases were Reported Present During Each Week in 1887.*

Weeks ending :—		Diphtheria.	Scarlet Fever.	Typhoid Fever.	Measles.	Small-pox.	Typhus Fever.
January	8	29	20	8	12	0	0
	15	22	16	6	11	0	0
	22	27	11	7	11	0	0
	29	26	13	7	12	0	0
February	5	17	18	6	13	0	0
	12	21	21	9	12	0	0
	19	13	19	9	12	0	0
	26	10	16	6	15	0	0
March	5	13	20	6	17	0	0
	12	24	21	7	21	0	0
	19	19	19	7	19	0	0
	26	12	17	7	16	0	0
April	2	12	25	3	13	0	0
	9	9	15	3	13	0	0
	16	8	14	3	14	1	0
	23	11	17	3	16	1	0
	30	12	20	4	18	0	0
May	7	16	19	4	25	0	0
	14	13	14	3	22	0	0
	21	17	12	3	16	0	0
	28	9	10	3	22	0	0
June	4	12	15	7	20	1	0
	11	12	14	3	18	0	0
	18	10	14	3	13	1	0
	25	16	16	5	14	1	0
July	2	14	6	6	9	1	1
	9	17	10	5	19	0	1
	16	10	9	7	12	0	1
	23	12	12	10	12	0	1
	30	14	7	7	6	0	0
August	6	22	15	17	7	0	0
	13	17	11	18	4	0	0
	20	10	9	20	6	0	0
	27	15	10	19	4	0	0
September	3	23	13	25	2	0	0
	10	18	9	23	2	0	0
	17	22	9	26	1	1	0
	24	25	9	26	3	1	0
October	1	23	12	27	2	1	0
	8	21	17	19	4	1	0
	15	30	14	20	6	1	0
	22	29	17	23	6	1	0
	29	15	13	22	4	0	0
November	5	25	13	20	4	0	0
	12	29	15	20	11	0	0
	19	37	14	14	8	0	0
	26	25	15	14	9	0	0
December	3	23	14	10	9	0	0
	10	17	16	13	12	0	0
	17	21	12	9	14	0	0
	24	13	12	9	6	0	0
	31	18	17	13	7	0	0
Average per week		17.98	14.33	11.04	11.23	.23	.08

DIPHTHERIA IN MICHIGAN—YEAR ENDING DECEMBER 31, 1887.

On page 224 is a map of the State of Michigan exhibiting, for each county, the number of localities where diphtheria was reported to have occurred; also the number of outbreaks, cases and deaths which were reported to have occurred in each county during 1887. From this it may be seen that 28 outbreaks in 18 localities with 986 cases and 239 deaths occurred in Wayne county alone; also that 1,828 cases and 436 deaths, or over half of all the cases (3,293) and deaths (815) of the whole State occurred in 10 of the 81 counties of the State. These 10 counties in the order of the greater number of



Distribution of Diphtheria reported in Michigan in 1887.

Deaths in each of the years 1876 – 82 are shown in a Map on page 113 Report of this Board for 1883.

Relations of diphtheria to Railroads are shown in a map on page 257, Report for 1886.

L.= Localities. O.= Outbreaks. C.= Cases. D.= Deaths.

reported cases are: Wayne, 986; Kent, 193; Monroe, 115; Jackson, 105; Bay, 86; Tuscola, 77; Washtenaw, 72; Saginaw, 70; Sanilac, 70; and Berrien 70. It may also be seen that from 14 counties no diphtheria was reported. They are as follows: Alger, Baraga, Charlevoix, Cheboygan, Delta, Gladwin, Iron, Isle Royal, Luce, Manitou, Montmorency, Presque Isle, Roscommon and Schoolcraft.

As a rule, the counties from which there was little or no diphtheria reported are new and sparsely populated, and there is not rapid and easy railroad or other means of communication; while those counties from which most diphtheria was reported are the older and more densely populated, and are provided with means for rapid travel and ready communication, which tend to spread communicable diseases.

DIPHTHERIA IN 1887 COMPARED WITH PREVIOUS YEARS.

During the year 1887 there were reported to the office of the State Board of Health 466* outbreaks in 371 localities. In these outbreaks there were reported 3,382 cases and 825 deaths; the average number of cases per outbreak was 7.3; the average number of deaths per outbreak was 1.8, and the per cent of deaths to cases was 24. In 1886 there were reported 550 outbreaks in 422 localities, with 4,244 cases and 982 deaths; the average number of cases per outbreak was 7.7; the average number of deaths per outbreak was 1.8, and the per cent of deaths to cases was 23. There was thus reported 51 localities, 84 outbreaks, 862 cases, and 157 deaths less in 1887 than in 1886: also the average number of cases per outbreak was .4 less, while the average number of deaths per outbreak remained the same, and the per cent of deaths to cases was one greater.

Comparisons with former years would doubtless have been very interesting and instructive, if complete reports had been made to this office, and the method of compiling them had been uniform; but from year to year there has been a steady improvement, both in the methods employed by the office of the State Board of Health for securing reports, and in the efforts made by the local health authorities to furnish this important information to the State Board of Health, and, it is believed that, there has also been marked improvement in the method of compiling this information.

The use of the blank form [M] for weekly reports of communicable diseases was begun in May, 1883, which thereafter undoubtedly brought information of cases to this office that otherwise would have failed to reach here. Also, in 1884, for the first time, a search was made through the annual reports, made at the close of the year, to discover whether or not they agreed with the special reports, made during and at the close of outbreaks; and there were found 169 outbreaks of diphtheria in 132 localities with 1,100 cases and 237 deaths which had not been reported by the special reports. These were included in the numbers given in the report for that year, and the annual reports have been used in compiling the communicable diseases for succeeding years. Again, from year to year, the State Board of Health has distributed an increasing number of blanks for reporting communicable diseases, and, also, documents on their restriction and prevention, which contain a copy of the law to the effect that a fine of fifty dollars may be imposed for failing to report a case of a disease dangerous to the public health.

---

* It is sometimes difficult to decide whether cases in a given place constitute one outbreak or more than one. In connection with a table and diagram on following pages the number of outbreaks is stated differently, but a foot-note gives the reason why.

The following table would be very misleading if the above facts were not kept clearly in mind. Thus, although the number of cases of and deaths from diphtheria reported to this office, as given in the following table, steadily increase during the six years from 1882 to 1887 (except in the last year which shows a marked decrease) it is probable that on account of the great number of documents on the restriction and prevention of diphtheria, which have been distributed, and on account of the increased efforts of health officers to thoroughly isolate patients and disinfect houses, clothing, etc., the actual numbers of cases of and deaths from diphtheria per annum in Michigan are decreasing from year to year.* This is shown by the weekly reports of the regular correspondents of the State Board of Health (see p. 89 of this Report) which are more uniform and probably the best evidence on this subject yet obtained. These reports show that diphtheria has steadily decreased since 1881, until in 1887 there was reported not quite a third as much as in 1881. However, diphtheria seems naturally to increase and decrease in waves, the crests of which are several years apart, which may largely account for this decrease.

---

* See Table and Diagram on pp. 235-236, showing that diphtheria is greatly restricted by these efforts.

TABLE.—*Diphtheria in Michigan: Numbers of Reported Outbreaks, Localities (in which they occurred), Cases and Deaths; the Average Number of Cases and the Average Number of Deaths per Outbreak; and the Per Cent of Deaths to Cases, as reported for each of the Six Years, 1882-1887.*

Year.	Reported Outbreaks.	Reported Localities.	Reported Cases.	Av. No. of Cases per Outbreak.	Reported Deaths.	Av. No. of Deaths per Outbreak.	Per Cent of Deaths to Cases.
1882	....	163	2,046	....	495	....	24
1883*	....	125	2,246	....	543	....	24
1884†	362	302	3,915	10.8	905	2.5	23
1885	467	396	4,018	8.6	964	2.	24
1886	550	422	4,244	7.7	982	1.8	23
1887	466	371	3,382	7.3	825	1.8	24

* The use of the blank form, "M," for weekly reports was begun in May, 1883.
† The use of the annual reports of health officers in compiling diphtheria was begun in 1884.

TABLE.—*Exhibiting the number of outbreaks beginning and the number ending in each month during the year 1887. The total number of outbreaks here given is 370, that being all in which the date of the first and last case was definitely reported.*

	Jan.	Feb.	March	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Began (first case taken sick)	50	17	42	24	18	17	32	28	31	39	49	23
Ended (last case taken sick)	32	15	41	22	23	12	29	26	26	32	50	62

SOURCE OF CONTAGIUM.

In 158 outbreaks of diphtheria the reporters (health officers or clerks) were able to trace the disease to its probable source, either within or beyond the limits of their respective jurisdictions; and in 107 of these outbreaks the contagium was, with various degrees of certainty, traced to previous cases of diphtheria, while 51 were attributed to unsanitary conditions. In 4 outbreaks the disease was attributed to "cold," in 12 it was called "sporadic," which is equivalent to "unable to trace it to its source." To the question concerning source of contagium, 121 replied "unknown," and 171 made no reply. It is to be regretted that the reports of health officers on this subject are so imperfect,—in over one-third of the outbreaks no report whatever was made concerning the source of contagium.

Reported Source.	No. of Outbreaks.
Traced to a former case	39
Probably to a former case	68*
Unsanitary conditions	51
"Cold"	4
Unknown (includes 12 outbreaks reported "sporadic")	133
Not reported	171
All outbreaks	446

*Of these 68 outbreaks, 50 were reported "contracted outside of jurisdiction" or "contracted while visiting in another county" and similar expressions.

Traced to a Former Case.

The following are representative statements from those that have been classified as "traced to a former case," with the name of the health officer subjoined:—

"Three weeks before the first case came down with diphtheria he with his brother were in Camden, Hillsdale county, Mich., and played about ten minutes in the door yard where they had diphtheria in the house."—*Dr. E. J. Eyres, health officer, California township, Branch county.*

"Brought from Lawrence (six miles east) by friends who had recovered from the disease, but whose clothing had not been disinfected."—*Dr. H. C. Maynard, health officer, Hartford township, Van Buren county.*

"The poison was carried from Detroit, where a member of the family had been visiting a relative in whose house there had been recently or were at the time two cases of diphtheria."—*J. M. Collier, M. D., (attending physician, health officer of Plymouth) Livonia township, Wayne county.*

"Carried into the family by a brother's child living in Monroe, who had the disease about two or three weeks previous."—*O. J. Leonard, M. D., health officer, La Salle township, Monroe county.*

"There had been no diphtheria in this locality and the family were not at all exposed until they all went to Ishpeming and stayed two nights in a house where two children had died of it a few days before."—*H. M. Haskell, M. D., health officer, Palmer.*

"The first case slept in an infected house."—*J. B. Park, M. D., health officer, Meridian township, Ingham county.*

"Disease contracted from a person coming into the family who had just recovered from the disease."—*Dr. W. J. Ketchum, health officer, Dowagiac.*

"A corpse sent from Kansas for burial in Howell cemetery."—*Wm. Suhr, clerk, Genoa township, Livingston county.*

"It spread in my jurisdiction from persons having the same in the township of Fraser."—*Karl B. Schmidt, health officer, Kawkawlin township, Bay county.*

"This the third case from the same camp some twelve miles from our village."—*C. L. Bingham, health officer, Pinconning township, Bay county.*

"The family were visiting at Reese, Mich., and contracted the disease from children affected with the disease."—*J. W. Pennock, M. D., health officer, Livingston township, Otsego county.*

"The disease was introduced into my township from neighbors in the township of Hartwick.

Both families live on the township line, and passed back and forth as neighbors do in sickness."—*Geo. W. Culver, health officer, Highland township, Osceola county.*

"The child attended the funeral of an aunt at Osseo, where there had been children suffering with the disease."—*Dr. C. M. Butler, health officer, Morenci.*

"The patient's brother attending school at Elmhurst, Ill., was taken sick with the disease on October 10. Having recovered, the authorities of the school sent him home without disinfecting his clothing. He reached home October 22, and on the following Sunday, five days later, his sister was attacked."—*A. C. Taylor, M. D., (attending physician) Freedom township, Washtenaw county.*

"From Wright township. Brought from Jackson county to Wright."—*Dr. Wilford Bates, health officer, Ransom township, Hillsdale county.*

"Contracted by playing with children down with the disease in the adjoining township of Rose Lake. * * * In my opinion the disease was, also, carried some by a house dog which ran all over the neighborhood and the disease followed after him."—*G. R. Andrews, M. D., health officer, LeRoy.*

"Personal contact with the disease."—*Dr. J. A. Watson, health officer, Maple Valley township Sanilac county.*

"Direct contagion from an outside source."—*Edward Cordey, M. D., health officer, Watertown township, Tuscola county.*

"Number one was taken at his boarding house in Detroit, and being brought home communicated it to numbers two, three and four." In another instance: "Was brought from Detroit by the mother going to see one of her children who was taken with diphtheria while stopping with an aunt."—*Dr. W. Simonds, health officer, Warren township, Macomb county.*

"Contracted the disease in Grand Rapids."—*A. J. Patterson, M. D. health officer, Cannon township, Kent county.*

"Mr. and Mrs. S. visited a sister in Ann Arbor in whose family there was diphtheria and one death at the time of their visit. In about six weeks from their return home these children came down."—*Dr. John N. Greene, health officer, Iosco township, Livingston county.*

"A servant girl at the residence of F. W., Lansing, Mich., was taken sick with diphtheria, and was permitted by attending physician to be conveyed into my jurisdiction. * * * This was an instance in which all the children of one family had diphtheria. The isolation was only from other families, except in the case of the oldest girl (18 years) who was isolated for a period of three weeks after the last of the others was sick. Then she came home, and proceeded to tear and sew prints which had lain in a room during one night where one of the family was sick with diphtheria. The prints were discovered, after being in the room one night, and carried away without being fumigated with the other clothing. Within three or four days after tearing and sewing the prints, this young woman was taken sick with diphtheria."—*A. D. Banks, health officer, Delta township, Eaton county.*

"Direct exposure to the disease in a family that were exposed to it in Bad Axe, Huron county."—*Daniel McGregor, health officer, Bloomfield township, Huron county.*

"From cases which came down in the high school at Northville."—*R. M. Johnson, M. D., health officer, Novi township, Oakland county.*

"Contagion from cases occurring in Bronson township."—*C. D. Parsons, M. D., health officer, Burr Oak.*

It seems to be a general fact that diphtheria (and the same is true of other dangerous communicable diseases) is spread from railroad centers; thus in localities near Detroit it is reported to have been contracted in Detroit, in localities near Lansing it is reported to have been contracted in Lansing.

Outbreaks Probably Traced to Former Cases.

"Brought from Detroit either in the persons of children who were just recovering from bad sore throat' or in the clothes belonging to an elder brother who died of the same disease in Detroit."—*O. B. Wiley, M. D., health officer, Brighton.*

"A child died in Ohio of diphtheria, as I believe, but the attending physician claimed it was membranous croup. The child was brought here for burial. While on the journey a young child came down with diphtheria. An aunt nursing the patient contracted the disease, through which she lost her life."—*W. H. Chivers, M. D., health officer, Colon township, St. Joseph county.*

"From the township of Sebewa."—*Geo. D. Allen, M. D., health officer, Portland.*

"As near as I can learn, the disease was brought into my jurisdiction by a visitor from Reese, where it was prevailing. A boy, six years old, of the family visited was the first one sick with the disease."—*Dr. Sylvester J. Smith, health officer, Fair Grove township, Tuscola county.*

"Supposed to have come from an imported case which had been diagnosed quinsy. Case came from Pinconning, and died within thirty-six hours after arrival."—*Dr. Wm. H. Fulton, health officer, Akron township, Tuscola county.*

"The source of contagium, I suppose, was from a family who came to visit the neighborhood. The children of this family had diphtheria, and were reported well a month before. The first one taken of the family, concerning which I am reporting, slept one night with a child of the visiting family."—*H. Roy, M. D., health officer, Forester township, Sanilac county.*

"We think it came from the township of Venice; for they had diphtheria just across the line, and we think the disease was contracted at meetings held there which people from my jurisdiction attended."—*James W. Goodfellow, health officer, Venice township, Shiawassee county.*

"The disease prevails just over the line in Muskegon county. A boy residing in that neighborhood came here the same day he was taken down."—*W. A. Fallas, M. D., health officer, Coopersville.*

"The child was visiting in Rockland, an infected district twelve miles from here, where an epidemic of diphtheria was raging, and must have come in contact with an infected person. A child in the family visited was taken sick a day later."—*Wm. Collins, health officer, Ontonagon.*

"The child went to Ann Arbor on Monday with its parents, and while there played with a child which died the following Saturday of "measles," at least called so. Diphtheria was and is in Ann Arbor."—*Dr. T. J. Ritter, health officer, Dexter.*

"The person sick, clerk in a shoe store, was brought here from Hudson. He reports having waited upon and sold a pair of shoes to a lady who, two days later, was taken sick with diphtheria. Three days after waiting upon the lady the clerk was taken sick with diphtheria."—*Dr. J. D. Ely, health officer, Medina township, Lenawee county.*

"The first case, a child, went on a visit to Manistee and was there held and handled by a physician, a relative of hers, from Ludington, five days before she came down with the disease." [There had been some 40 cases of diphtheria reported in Ludington just before this.]—*G. F. Knowles, M. D., health officer, Onekama township, Manistee county.*

"It was transported from Osceola county by the family who moved from there about ten weeks ago."—*Dr. Geo. W. Howland, health officer, Flint.*

"Diphtheria case came into our township from Leroy, Osceola county, having been isolated on a street where diphtheria was raging."—*F. F. Taylor, clerk board of health, Elsworth township, Lake county.*

"She contracted the disease in Grand Rapids."—*Dr. Albert J. Patterson, Cannon township, Kent county.*

"From Grand Rapids."—*Dr. Wm. Hyser, health officer, Plainfield township, Kent county.*

"From infection carried in clothing."—*Samuel McKiller, health officer, Goodland township, Lapeer county.*

"Visited the sick."—*T. A. Digue, clerk, Frenchtown township, Monroe county.*

"Brought from Detroit and communicated to the brother and sister by case No. 1."—*W. W. Wilson, M. D., health officer, Farmington.*

"Coming in contact with a person supposed to have had diphtheria about six weeks before in Grand Rapids."—*John W. Narrington, health officer, Olive township, Ottawa county.*

"Contracted at the county fair."—*James K. Bennett, clerk, Chester township, Ottawa county.*

"Brought by persons moving into this district."—*Henry Straffon, health officer, Buell township, Sanilac county.*

"Contracted while visiting in Chicago."—*M. E. Heath, M. D., health officer, Cadillac.*

"From Mancelona, Mich."—*Wm. Campbell, clerk, Custer township, Antrim county.*

"It was taken from infected clothing left by a former case of diphtheria that died in the same family and house. After a careful examination of all the surroundings the health officer comes to this conclusion, as there have been five cases within three years in the same family."—*Charles P. Reynolds, health officer, Harrisville township, Alcona county.*

OUTBREAKS ATTRIBUTED TO UNSANITARY CONDITIONS.

The following are representative statements, concerning source of contagium, from the 51 which are classified in the preceding table under "unsanitary conditions":—

"A dirty house, no air, floor on ground or nearly so; sheep, hog and cow stables too near the house and a foul ditch near the well." "Defective drain and soil pipe." "Filthy dwelling, defective drainage, etc." "Extreme filth." "Decaying vegetables and damp cellar." "Bad drinking water and damp cellar." "Bad surroundings." "Lake water and filth." "Supposed to be bad water."

How much effort was made in the foregoing cases to trace the disease to a previous case cannot now be known. Of course it is possible that the conditions reported were simply accidental, and had no causal relation to the disease. The relation of diphtheria to such conditions as filthy surroundings cannot be learned until we succeed in obtaining statements of those conditions in a large number of outbreaks, where the disease is and where it is not traced to previous cases.

DIFFERENCES IN DIAGNOSIS.

Disagreement in diagnosis frequently occurs, in great part due to different views as to what constitutes diphtheria; physicians frequently holding that nothing is diphtheria except when there is actually found diphtheritic necrosis—the so-called false membrane. The accumulated experience with this disease during its extensive history, and the weight of authority seem to indicate that, in the adult, diphtheria is not, as a rule, characterized by the presence of the false membrane, certainly not for any considerable time, so that unless seen just at the right time no patch is found, and when found it is likely to be small. Yet such cases are capable of communicating to children unmistakable diphtheria. Also, irrespective of age, there are "benignant cases" where there is catarrhal manifestation but no membrane forms;* and still others where a membrane forms on organs other than those of the throat and thus escapes detection. These forms of this disease appear to be the most prolific cause of the spread of diphtheria in Michigan. Frequently in such cases the disease is not recognized as anything serious, and a physician is not called, or when one is called the disease being of such a mild form awakens doubts as to its true nature. Whenever there is any question, the patient should be isolated, and disinfection should take place with as much care and thoroughness as if it were a marked case of diphtheria, as diphtheria of even the most malignant type often develops from just such cases.

On Nov. 17, 1887, Dr. R. Henderson, health officer of Buchanan, reported concerning an outbreak in his jurisdiction as follows:

About three weeks since a child died here with what was termed membranous croup; a week later another in a different family; then two others in each of two still other families took it. Finally two children came under my care. After a few days I pronounced it diphtheria. I was discharged, and a second physician (same one who attended the other four cases) came in and called it membranous croup. They died after two weeks' sickness. One left in the family now has it, and there are still two other cases sick with it. I ordered up a sign over the two I saw and it was not put up. One other physician called it diphtheria, seeing them two days before they died. A fourth docto saw them after death, and, without a post mortem, called it membranous croup."

In a later report (Nov. 26, 1887,) Dr. Henderson says: "The cases vary wonderfully from very light with slight hoarseness, little fever and rapid recovery, to most virulent symptoms in the very next case in the same family." There were reported 28 cases and 13 deaths in this outbreak. For the last six years there has been an average of one death in 4.1 cases of diphtheria in Michigan, and these 13 deaths indicate that there were probably over 50 cases in this outbreak, the 28 cases reported probably being only the severer ones.

---

*Ziemsen, p. 595 (a); and Quain, p. 375.

Concerning an outbreak in Inland township, Benzie county, about June 12, 1887, Horace B. Pratt, health officer, reports in substance that a man came from the Upper Peninsula sick with what he said a doctor at Kingsley pronounced quinsy. He came home and went to the houses where diphtheria broke out. Soon a babe was taken very sick. A physician called from Traverse City pronounced it polypus. The child died. On investigation the health officer found four others sick, and another physician, Dr. Kneeland, from Traverse City, in attendance, pronounced the disease diphtheria. The man who had come from the Upper Peninsula with what had been called quinsy proved to be suffering with diphtheritic paralysis. Vigorous efforts were then made to restrict the further spread of the disease; but the contagium was already wide-spread, and 28 cases and 4 deaths were reported as having occurred before it could be stamped out.

Dr. B. D. Ashton, member of the Legislature from Traverse City (health officer of that city for 1888), made an interesting report to this office on April 27, 1888, of a communicable sore throat which prevailed for some time in Traverse City, without there certainly occurring any deaths from the disease, and without its being regarded as dangerous. But it was carried into Leland township, where it developed more malignant symptoms and deaths occurred. A. John, health officer of Leland township, reported the disease diphtheria, and stated that three deaths occurred in his jurisdiction during the outbreak. During the outbreak in Inland township, Benzie county, above mentioned, H. B. Pratt, health officer of the township, in his report of June 21, stated that the attending physician, Dr. Kneeland of Traverse City, informed him that diphtheria had existed for three months in Traverse City. From this it seems that some of the physicians considered this outbreak at Traverse City to be diphtheria.

MEASURES TAKEN TO RESTRICT DIPHTHERIA—RESULTS.

The following are representative statements of health officers who reported quite fully that they enforced strict isolation and thorough disinfection:

Dr. T. A. Cullis, health officer of Vassar, reporting the measures which he employed in restricting an outbreak of diphtheria which occurred Jan. 20, 1887, and which was limited to one case, stated in substance the following:

> Kept the patient in a room by herself isolated from all except nurses and physician. The whole house was disinfected by burning sulphur at the rate of about 4 lbs. per 1,000 cubic feet of air space, and also by bromo chloralum. The clothing was disinfected in sulphate of zinc solution; discharges were disinfected by a sulphate of iron solution; privy by fumes of burning sulphur, and the contents of the privy vault were disinfected by chloride of lime.

An outbreak occurred April 12, 1887, in the township of Venice, Shiawassee county, which was restricted to two cases. The health officer, J. W. Goodfellow, reported the measures taken to restrict the spread substantially as follows;

> Isolated the people of the house from all except the physician, and provided for all their wants. There was only one room, in which the family lived. It was fumigated with 6 lbs. of burning sulphur, which was about 3 lbs, per 1,000 cubic feet of air space. Everything but bedding and furniture was burned. Cloths that were used about the patient and all discharges, after being thrown

into a copperas solution, were buried. The privy was disinfected by the fumes of 3 pounds of burning sulphur, and the contents of the privy vault were disinfected with 2 lbs. of copperas, and with carbolic acid.

Concerning the measures taken to restrict an outbreak of diphtheria which occurred at Paw Paw Nov. 3, 1887, and which was limited to two cases, the health officer, C. S. Maynard, M. D., reported substantially the following:

Kept the patient in the room apart from the family and isolated from other people except nurse and physician, until the house was thoroughly fumigated. The clothing was treated with sulphate of iron. All rooms in the house were disinfected by being fumigated with 10 lbs. of burning sulphur which was about 4 lbs. per 1,000 cubic feet of air space. The privy was disinfected with fumes of burning sulphur. The contents of the privy-vault were disinfected with several pounds of chloride of lime and sulphate of iron.

Concerning the measures taken to restrict an outbreak of diphtheria which occurred in the village of Montague, Feb. 15, 1887, and which was restricted to one case, the health officer, Dr. L. E. Jones, reported substantially the following:

The patient was placed in a room, from which all unnecessary articles were removed, and there isolated from all other people except nurses and physician. All rooms in the house, including cellar and garret, after having been made tight, were fumigated with 10 lbs. of burning sulphur which was about 3 lbs. per 1,000 cubic feet of air space. Clothing was boiled in sulphate of zinc, and chloride of sodium. The discharges of the patient and the contents of the privy-vault were treated with a solution of copperas in large quantities, as recommended in the document [of instructions issued by the State Board of Health], and the privy was disinfected with fumes of burning sulphur.

Dr. H. P. Moury, health officer of Bronson township, Branch county, reporting the measures which he employed in restricting an outbreak which occurred Jan. 20, 1887, and which was restricted to one case, stated in substance the following:—

The patient was isolated from all persons except nurse and physician. All rooms in the house, including the garret, were fumigated with burning sulphur at the rate of 6 lbs. per 1,000 cubic feet of air space. The clothing was disinfected with zinc solution; discharges passed in the room, with carbolic acid; contents of the privy-vault with chloride of lime.

Quite a number of health officers described at length thorough use of disinfectants; but, regarding isolation, simply reported: "house placarded," "sign put up," "notice given to the public," and similar statements, thus leaving it in doubt whether the public were prohibited from intercourse with the family, and whether the patient was isolated from all except nurse and physician. Also a large number reported isolation thoroughly enforced, but did not mention the use of disinfectants. A few stated that neither isolation nor disinfection were enforced, and quite a large number indicated that either one or the other was neglected. Also quite a large number were entirely silent on measures of restriction.

TRANSGRESSION OF PUBLIC-HEALTH LAWS.

Occasionally reports reach this office of transgressions of the law by physicians and others who fail to promptly report cases of communicable disease dangerous to the public health to the health officer so that the local board may immediately take vigorous measures to stop the spread. In a number of instances the people have transgressed the law by visiting patients ordered disolate by the health officer. Also in a number of outbreaks the health officers have neglected their duty by failing to vigorously enforce isolation, and, in person, to thoroughly disinfect house, furniture, clothing, etc., at the close of the outbreak, and to secure the disinfection of the privy and the discharges of the patient during the outbreak.

An outbreak of diphtheria occurred in October in the township of Mancelona, Antrim county, from which there were reported some 20 cases and 6 deaths. The health officer, A. H. Rockwell, M. D., reported the following transgression of the law: "Many of the cases have not been reported until the patients have either died or recovered, and it has been impossible to give anything like an accurate report. * * * I have met one of the doctors of this place on the street on two occasions, and inquired about his diphtheria patients, at which times he has reported cases which had already recovered or died."

An outbreak of diphtheria occurred in the village of Lawrence, March 1, 1887, in which there seems to have been a great deal of neglect. The health officer, Dr. Albert S. Haskins, mentioned six cases which were not reported as the law directs. To the question, were the patients kept isolated from other people except nurse and physician? he replied: "Not generally." In answer to the question as to how the rooms were disinfected he replied: "Burning tar and turpentine continually in the rooms and occasionally burning coffee." It would be difficult to contrive a more effectual plan of non-interference with the germs of disease than this one, and it is not surprising that to the question concerning the success attending the efforts at restriction he replied: "Imperceptible." There were reported 18 cases and 7 deaths in this outbreak, and, from these figures showing so many deaths, it is probable that quite a number of cases were not reported.

Concerning an outbreak of diphtheria in the township of Erie, Monroe county, which began June 24, 1887, and continued until in November, the report of the health officer, Dr. K. K. Harris, indicates that the measures were very imperfect. To the question whether the patients were isolated from other persons except nurse and physician, he replied: "As much as possible; but it is an impossibility in many cases;" and regarding disinfection he reported: "Burned sulphur in rooms occupied and also in the house four or five times a day, and gave sulphur to other members of the family." These and similar expressions show that the instructions contained in the document issued by the State Board of Health, on the restriction and prevention of diphtheria, were not followed. There were reported 65 cases and 5 deaths in this outbreak.

The evil consequences of the transgression of health regulations are strikingly exemplified by the outbreak in Rockland township, Ontonagon county, which began October 5, 1887, and ended January 14, 1888. Regarding isolation the acting health officer, Henry K. Lum, M. D., reported the following: "I found it almost impossible to keep persons out of houses infected, there being a large French element who would go at night to infected houses." There were reported in this outbreak 61 cases and 13 deaths.

An outbreak occurred in Livonia township, Wayne county, January 18, 1887. The report of the health officer, Lorenzo G. Pierson, shows that the measures taken to stop the spread of the disease were very lax. To the question, "Were the patients kept isolated from other persons except nurse and physician?" he replied: "I tried to, but could not in all cases." And again he says: "Am quite of the opinion that the disease has been spread around by inconsiderate visiting and calling on those sick with the disease." Regarding disinfection he said: "Left with physicians while sick; don't know what they always used," and to a number of special questions concerning kind and quantity of disinfectants used he replied: "Don't know," showing that, instead of performing his special and important duties as health officer, he neglected them. In this outbreak there were *reported* 28 cases and 13 deaths, and these 13 deaths indicate the occurrence of over 50 cases instead of 28. It is probable that many were not reported to the health officer.

DIPHTHERIA OUTBREAK IN AN UNFORTUNATE LOCALITY.

Concerning an outbreak of diphtheria in Northville, Dr. J. M. Swift, regular correspondent of the State Board of Health, in a reply on August 3, 1887, to a letter of inquiry from this office, stated the following:

> "The case of diphtheria reported is in this village on Main street, residence on second floor, meat market on first floor—a very public and much frequented place. The case is a little boy, six years old, residing in Detroit, who, with his brother, eight years old, came on Saturday, July 23, to visit their aunt during hot weather. On Monday, the 26th, the younger one was taken with a *virulent* form of diphtheria—a very severe type. The case progressed to convalescence, and is now very well except that paralysis of the vocal chords to a marked degree is manifest. Sunday, the 31st, the older brother was attacked; not so severe a case, but bad enough; progressing favorably. Yesterday, August 2, the hired girl, a young woman, 25 years old, I judge, who has been helping to care for the boys was taken and is suffering from a severe form. In all three cases constitutional effects are marked. Last night, at 11:30 o'clock, I had the family, patients and all, taken to a vacant house about a half mile out of the village, and the residence closed and fumigated thoroughly.
>
> "Hundreds of people of all ages visit the market daily, and I feared infection of the community, and in mandatory terms brought about the removal after all the streets were vacated at night. I fear future developments; but have done everything in my power to prevent the disease from spreading. The heat of weather precluded closing of windows, and right under the windows live other children in close adjoining houses, and multitudes *would* be on the street notwithstanding the posted notices, etc."

There were reported in this outbreak 75 cases and 5 deaths. It occurred at a season of the year when there is usually least danger of the spreading of the disease. But the people of the locality are to be congratulated upon the very small proportion of deaths to cases.

PRACTICAL RESULTS IN RESTRICTING DIPHTHERIA.

The following table and diagram exhibit some of the practical results of efforts at restricting diphtheria in Michigan during the year 1887. The table is compiled from the reports, letters, etc., of local health officers, and the diagram is constructed from the figures given in the table.

The first double column, marked "(1)" in the table, shows the average number of cases and the average number of deaths in all 398 outbreaks* (excluding Detroit, Jackson and Grand Rapids, where the disease was reported present all or much of the time throughout the year, and we have no knowledge of how many distinct outbreaks, owing their origin to different sources of contagium, occurred). The second double column gives the average number of cases and the average number of deaths in 202 outbreaks in which isolation and disinfection were not mentioned or concerning which the statements were of doubtful meaning. The third double column exhibits the average number of cases and the average number of deaths in the 118 outbreaks in which isolation or disinfection or both were neglected. The fourth double column shows the average number of cases and the average number of deaths in 78 outbreaks in which isolation and disinfection were both enforced.

---

* Whenever a break of sixty days or more has occurred in the progress of diphtheria it has hitherto been uniformly regarded as two different outbreaks, but in estimating outbreaks for this table, in those cases in which the second appearance of the disease originated from the first, the intermission was disregarded and it was treated as a single outbreak. Also, comparisons of *years* require that outbreaks be counted as closed at the close of the year; while in comparing *outbreaks* for testing the value of isolation and disinfection it is necessary to take complete outbreaks even where they extend from one year into the next. This explains the apparent discrepancy between the number of outbreaks here given and the number given at the beginning of this article.

TABLE.—*Exhibiting the Average number of cases and Average number of deaths reported per outbreak:—in all the 398 outbreaks reported; in the 202 outbreaks in which it is doubtful whether or not disinfection or isolation were secured; in the 118 outbreaks in which isolation or disinfection or both were neglected; and in the 78 outbreaks in which isolation and disinfection were both enforced. Compiled in the office of the Secretary of the State Board of Health, from reports made by local health officers.*

	(1) *All outbreaks (398 outbreaks.)		(2) Isolation or disinfection not mentioned or statements doubtful.† (202 outbreaks.)		(3) Isolation or disinfection, or both neglected. (118 outbreaks.)		(4) Isolation and disinfection both enforced. (78 outbreaks.)	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Totals	2,321	561	732	190	1,391	320	198	51
Averages	5.83	1.41	3.62	.94	11.79	2.71	2.54	.65

*Reports of Diphtheria in the cities of Detroit, Grand Rapids and Jackson are not included because of the difficulty in determining the beginning and ending of an outbreak in these cities, in which the disease is present in some part of the city nearly all of the time.

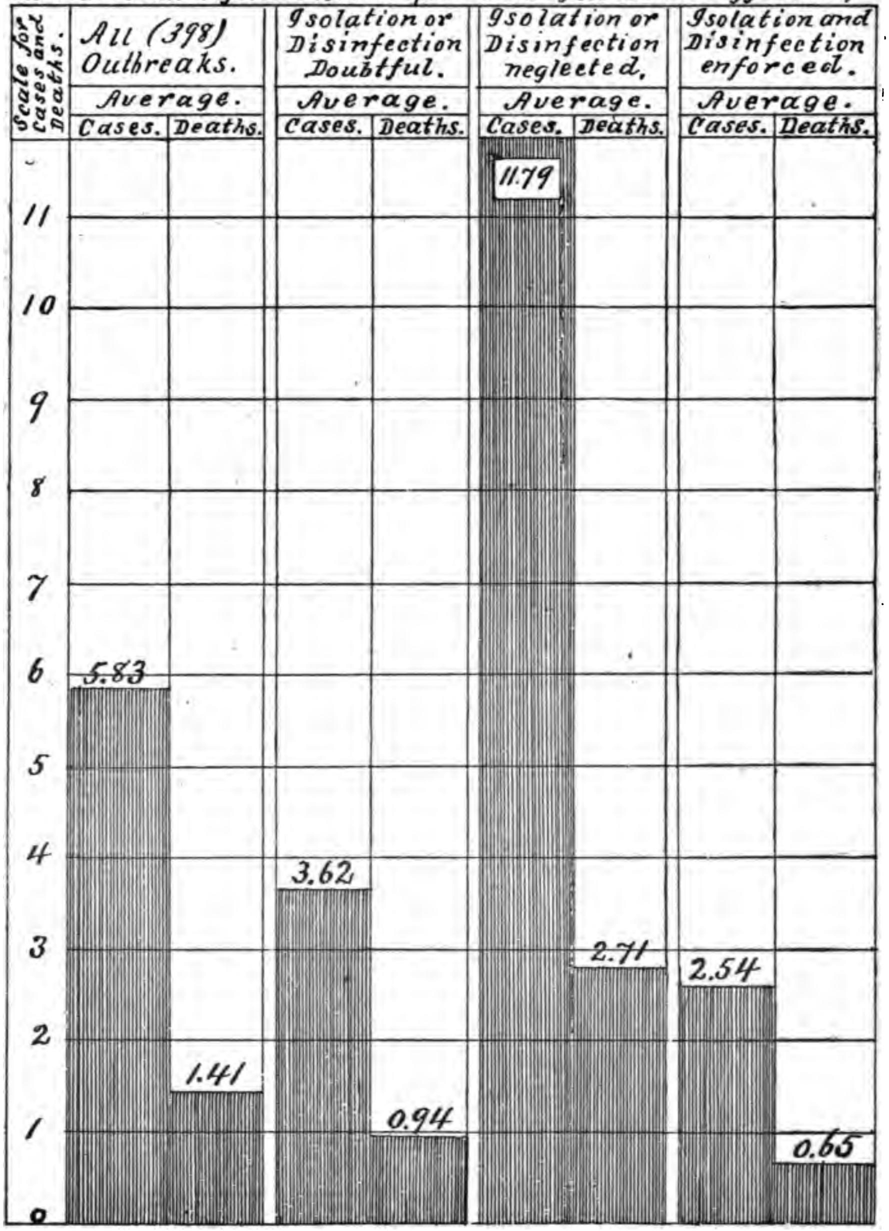
†There were quite a number of outbreaks in which isolation and disinfection appeared almost certainly to have been enforced; but, as this was not absolutely certain, they were put in this "doubtful" column; usually the doubt was only concerning one of the measures, the other having been thoroughly enforced. This accounts for the averages in this double column being so low. All cases and deaths, concerning which clear and positive statements were made by health officers, are included in the columns marked (3) and (4).

As shown in the table, all outbreaks reported were 398,* in which there were 2,321 cases and 561 deaths, making an average of 5.83 cases and 1.41 deaths per outbreak. In 202 outbreaks where isolation or disinfection were not mentioned, or the statements were of doubtful meaning, there were 732 cases and 190 deaths, making an average of 3.62 cases and .94 death per outbreak. Also, in 118 outbreaks in which isolation or disinfection or both were neglected there were 1,391 cases and 320 deaths, averaging 11.79 cases and 2.71 deaths per outbreak, while in 78 outbreaks in which isolation and disinfection were both enforced there were 198 cases and 51 deaths, or an average of only 2.54 cases and .65 deaths per outbreak, indicating a saving of 9.25 cases and 2.06 lives per outbreak, or 721 cases and 161 lives in the 78 outbreaks, by isolation and disinfection. Furthermore, if in all the 398 outbreaks there had been no restrictive efforts, and the averages had remained the same as in the 118 outbreaks in which we know isolation or disinfection was neglected, the total cases would have been 4,692 and the deaths would have been 1,079. Deducting the cases (2,321) and the deaths (561) which really occurred despite all the restrictive measures, and there is indicated a saving of 2,371 cases and 518 lives by these measures during the year 1887.

---

*Outbreaks in Detroit, Jackson and Grand Rapids are not included.

Diphtheria in Michigan in 1887, exhibiting the Average Numbers of Cases and Deaths per outbreak:- (1) in All the 398 outbreaks Reported; (2) in the 202 outbreaks in which it is Doubtful whether or not Disinfection and Isolation were secured; (3) in the 118 outbreaks in which Isolation or Disinfection or both were neglected; and (4) in the 78 outbreaks in which Isolation and Disinfection were both enforced. (Compiled in the office of the Secretary of the State Board of Health from reports made by local health officers.)



By a similar comparison made in the Report for 1886, pages 212–214, there is shown for that year a saving of over 4,374 cases and 833 lives from diphtheria by isolation and disinfection. Therefore for the two years 1886 and 1887 there were saved over 6,745 cases and 1,351 lives from this one disease.

On following pages of this Report it may be seen that for these same two years, 1886–7, there were saved by these restrictive measures in scarlet fever over 4,445 cases and 334 lives.

It thus appears that in the two diseases, diphtheria and scarlet fever, combined, during the two years 1886 and 1887, over 11,190* cases were prevented, and 1,685* lives saved in Michigan by isolation and disinfection.

Thus the local boards and health officers who faithfully enforced restrictive measures have the satisfaction of knowing that their efforts have proved of solid advantage in preventing much sickness and many deaths, with their concomitant suffering and sorrow, and those who have hitherto been negligent of duty will find in this evidence eloquent exhortation to increased diligence.

---

*As the double column showing outbreaks where "isolation or disinfection or both were neglected" includes quite a number of outbreaks where either isolation or disinfection was enforced or one or both enforced in part of the cases, it is evident why the averages are not nearly so great as they would have been if no efforts whatever had been made to stop the spread. For this reason it is plain that these figures do not show nearly all the cases and deaths prevented by isolation and disinfection.

PERIOD OF INCUBATION OF DIPHTHERIA.

It is somewhat difficult to determine the period of incubation of diphtheria. Often the exact time of exposure is uncertain, and, if the time of exposure is known, the poison may be carried in the clothing or hair for some time before it is introduced into the system.

The substance of the reports concerning the period of incubation, as observed in the fifty-five instances reported in fifty different outbreaks, is exhibited in the two tables which follow:

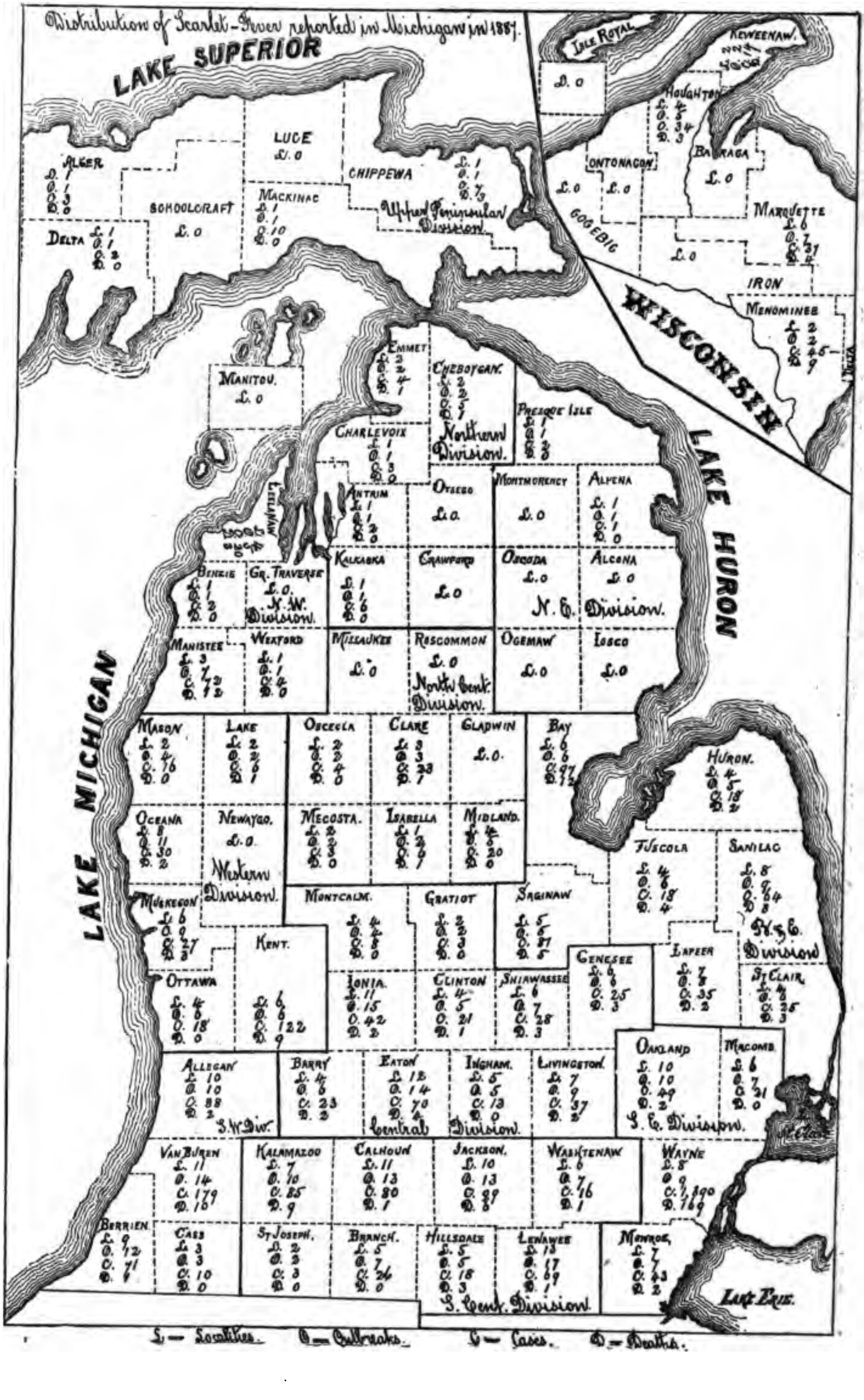
TABLE—*Exhibiting the Reported Period of Incubation in Days in thirty-five instances in Diphtheria. Compiled from reports of health officers in Michigan for the year 1887.*

	Period of Incubation, Stated in Days.															
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	20	21
Instances in Each Period.......	1	9	2	*4	3	†6	1	0	1	1	1	1	‡2	1	1	§1

*In one of these instances it was reported as "*about* five days."
†In two of these instances it was reported as "*about* seven days."
‡In one of these instances it was reported as "*about* fourteen days."
§ "About."

The average length of the period of incubation of diphtheria in the thirty-five instances is 7.3 days.

DISTRIBUTION OF SCARLET FEVER REPORTED IN MICHIGAN IN 1887.


Distribution of Scarlet-Fever reported in Michigan in 1887.
LAKE SUPERIOR
ALGER L. 1 O. 1 C. 3 D. 0
LUCE L. 0
CHIPPEWA L. 1 O. 1 C. 7 D. 3
SCHOOLCRAFT L. 0
MACKINAC L. 1 O. 1 C. 10 D. 0
Upper Peninsular Division.
DELTA L. 1 O. 1 C. 2 D. 0
ISLE ROYAL
KEWEENAW
L. 0
HOUGHTON L. 4 O. 5 C. 34 D. 3
ONTONAGON L. 0
L. 0
BARAGA L. 0
GOGEBIC
MARQUETTE L. 6 O. 7 C. 31 D. 4
L. 0
IRON
MENOMINEE L. 2 O. 2 C. 45 D. 9
DELTA
WISCONSIN
EMMET L. 2 O. 2 C. 4 D. 1
CHEBOYGAN L. 2 O. 2 C. 5 D. 1
Northern Division.
MANITOU L. 0
PRESQUE ISLE L. 1 O. 1 C. 2 D. 3
CHARLEVOIX L. 1 O. 1 C. 3 D. 0
LEELANAW
ANTRIM L. 1 O. 1 C. 2 D. 0
OTSEGO L. 0
MONTMORENCY L. 0
ALPENA L. 1 O. 1 C. 1 D. 0
BENZIE L. 1 O. 1 C. 2 D. 0
GR. TRAVERSE L. 0 N. W. Division.
KALKASKA L. 1 O. 1 C. 6 D. 0
CRAWFORD L. 0
OSCODA L. 0
ALCONA L. 0
N. E. Division.
LAKE HURON
MANISTEE L. 3 O. 7 C. 72 D. 12
WEXFORD L. 1 O. 1 C. 4 D. 0
MISSAUKEE L. 0
ROSCOMMON L. 0 North Cent. Division.
OGEMAW L. 0
IOSCO L. 0
LAKE MICHIGAN
MASON L. 2 O. 4 C. 76 D. 0
LAKE L. 2 O. 2 C. 6 D. 1
OSCEOLA L. 2 O. 2 C. 4 D. 0
CLARE L. 3 O. 3 C. 23 D. 7
GLADWIN L. 0
BAY L. 6 O. 6 C. 97 D. 12
HURON L. 4 O. 5 C. 18 D. 2
OCEANA L. 8 O. 11 C. 30 D. 2
NEWAYGO L. 0 Western Division.
MECOSTA L. 2 O. 2 C. 3 D. 0
ISABELLA L. 1 O. 2 C. 9 D. 7
MIDLAND L. 4 O. 5 C. 20 D. 0
TUSCOLA L. 4 O. 6 C. 18 D. 4
SANILAC L. 8 O. 9 C. 64 D. 8
N. E. Division
MUSKEGON L. 6 O. 9 C. 27 D. 3
MONTCALM L. 4 O. 4 C. 8 D. 0
GRATIOT L. 2 O. 2 C. 3 D. 0
SAGINAW L. 5 O. 5 C. 81 D. 5
KENT L. 6 O. 6 C. 122 D. 9
GENESEE L. 6 O. 6 C. 25 D. 3
LAPEER L. 7 O. 8 C. 35 D. 2
OTTAWA L. 4 O. 5 C. 18 D. 0
IONIA L. 11 O. 15 C. 42 D. 2
CLINTON L. 4 O. 5 C. 21 D. 1
SHIAWASSEE L. 6 O. 7 C. 28 D. 3
ST CLAIR L. 4 O. 5 C. 25 D. 3
ALLEGAN L. 10 O. 10 C. 88 D. 2
S. W. Div.
BARRY L. 4 O. 5 C. 23 D. 2
EATON L. 12 O. 14 C. 70 D. 4
INGHAM L. 5 O. 5 C. 13 D. 0
Central Division.
LIVINGSTON L. 7 O. 9 C. 37 D. 2
OAKLAND L. 10 O. 10 C. 49 D. 2
MACOMB L. 6 O. 7 C. 21 D. 0
S. E. Division.
St. Clair
VAN BUREN L. 11 O. 14 C. 179 D. 10
KALAMAZOO L. 7 O. 10 C. 85 D. 9
CALHOUN L. 11 O. 13 C. 80 D. 1
JACKSON L. 10 O. 13 C. 99 D. 8
WASHTENAW L. 6 O. 7 C. 16 D. 1
WAYNE L. 8 O. 9 C. 1,190 D. 169
BERRIEN L. 9 O. 12 C. 71 D. 4
CASS L. 3 O. 3 C. 10 D. 0
ST JOSEPH L. 2 O. 3 C. 3 D. 0
BRANCH L. 5 O. 7 C. 24 D. 0
HILLSDALE L. 5 O. 5 C. 18 D. 3
LENAWEE L. 13 O. 17 C. 69 D. 1
S. Cent. Division.
MONROE L. 7 O. 7 C. 43 D. 2
LAKE ERIE
L — Localities. O — Outbreaks. C — Cases. D — Deaths.

"I have investigated the case to the best of my ability, and I am of the opinion that it originated at home. Some five or six years ago a young lady died in the same house. The place at present is quite filthy, the privy being full to overflowing."

◆

SCARLET FEVER IN MICHIGAN—YEAR ENDING DEC. 31, 1887.

On weekly and special reports at or near the beginning of each outbreak, and the special final reports received at the close of each outbreak, and the annual reports received at the close of the year, there were reported 353 outbreaks in 299 localities, 3,400 cases, and 314 deaths from scarlet fever in Michigan during the year ending Dec. 31, 1887. From this it may be seen that the deaths were 9 per cent of the cases, and that there were an average of 9.63 cases per outbreak.

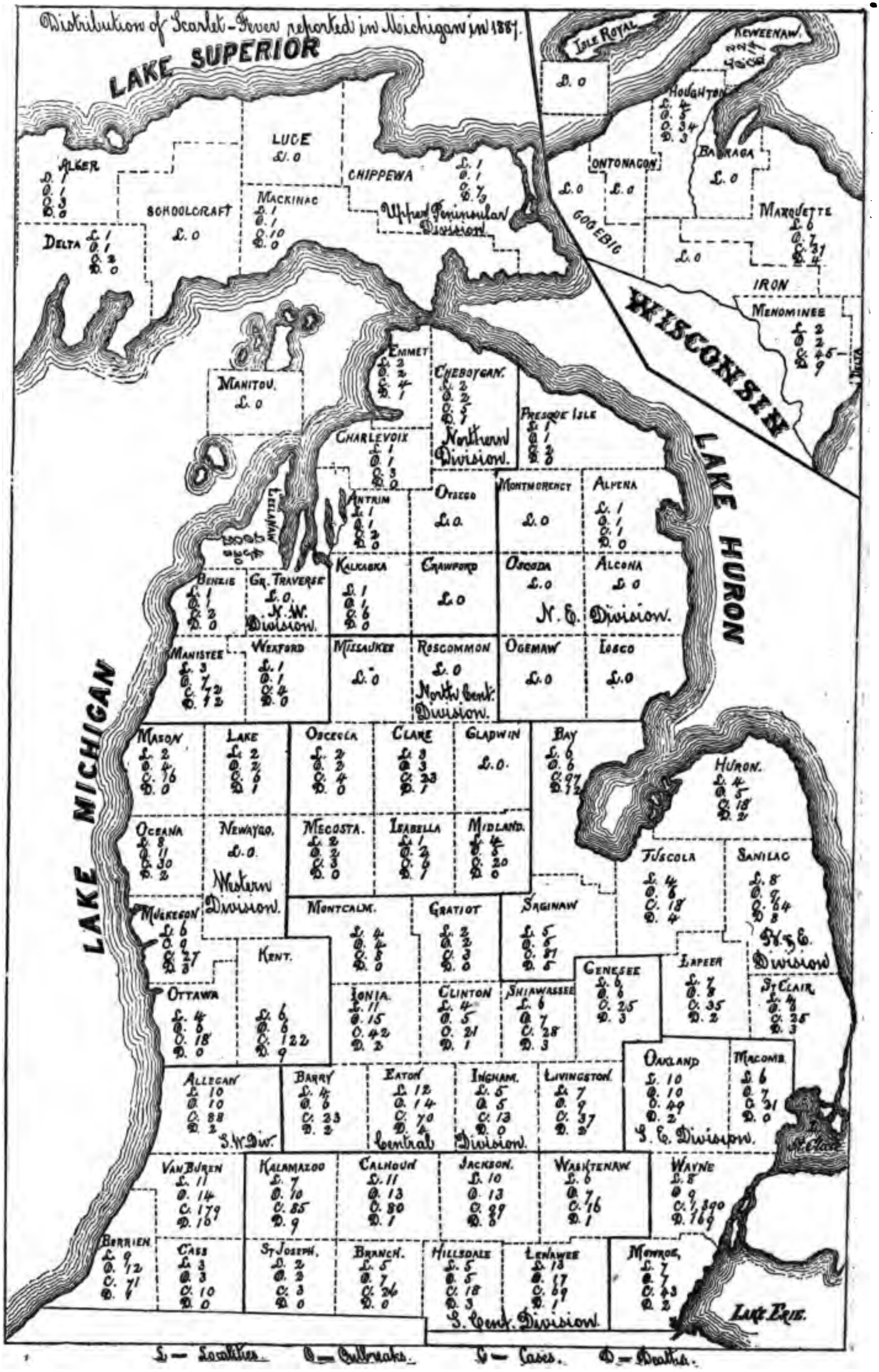
The map on page 240 exhibits the number of outbreaks, cases, and deaths from scarlet fever, and the number of localities in which they occurred in Michigan during the year ending Dec. 31, 1887. From this it may be seen that from 21 of the 84 counties in the State no cases of scarlet fever were reported. These 21 counties are as follows: Alcona, Arenac, Baraga, Crawford, Gladwin, Gogebic, Grand Traverse, Iosco, Iron, Isle Royal, Luce, Manitou, Missaukee, Montmorency, Newaygo, Ogemaw, Ontonagon, Osceola, Otsego, Roscommon and Schoolcraft. It may also be seen that from 14 of the 84 counties in the State there were reported 2,567 cases, while from all the 70 other counties combined there were reported only 843 cases, or from 14 counties there were reported three times as many cases as from the other 70 counties. These 14 counties in the order of the greatest number of reported cases are as follows: Wayne, 1,390; Van Buren, 179; Kent, 122; Jackson, 99; Bay, 97: Allegan, 88; Kalamazoo, 85; Saginaw, 81; Calhoun, 80; Manistee, 72; Berrien, 71; Eaton, 70; Lenawee, 69, and Sanilac, 64. From the first three of these 14 counties there were reported nearly as many (1,691) cases, as there were reported (1,709 cases) from all the other counties (81) combined.

As a rule the counties from which there was little or no scarlet fever reported are new and sparsely populated and there is not rapid and easy railroad or other means of communication; while those counties from which most scarlet fever was reported are the older and more densely populated and are provided with means for rapid travel and ready communication.

SCARLET FEVER IN 1887 COMPARED WITH PREVIOUS YEARS.

Comparisons with former years would doubtless have been very interesting and instructive, if complete reports had long been made to this office, and the method of compiling them had been uniform; but from year to year there has been a steady improvement both in the methods employed by the office of the State Board of Health for securing reports, and in the efforts made by the local health authorities to supply to the State Board of Health this important information; and it is believed that there has, also, been marked improvement in the method of compiling this information.

DISTRIBUTION OF SCARLET FEVER REPORTED IN MICHIGAN IN 1887.



L.— Localities. O.— Outbreaks. C.— Cases. D.— Deaths.

The use of the blank form "M" for weekly reports of communicable diseases was begun in May 1883, which thereafter undoubtedly brought information of cases to this office that otherwise would have failed to reach here. Also, in 1884 for the first time, a search was made through the annual reports, made at the close of the year, to see if they agreed with the special reports, made during and at the close of the outbreak, and there were found 920 cases of, and 107 deaths from scarlet fever which had been omitted from the special reports. These 920 cases and 107 deaths were included in the cases and deaths published for that year, and the annual reports have been used in compiling the communicable disease article for succeeding years. Again, from year to year the State Board of Health has distributed an increasing number of blanks for reporting communicable diseases, and, also, documents on their restriction and prevention containing a copy of the law to the effect that a fine of fifty dollars may be imposed for failing to report a case of a disease dangerous to the public health.

The following table would be very misleading, if the foregoing facts were not kept clearly in mind. Thus, although the number of cases of scarlet fever *reported to this office*, as exhibited in the following table, steadily increases from 1882-87, it is probable that (on account of the great number of documents on the restriction and prevention of scarlet fever which have been distributed, and on account of the increased efforts of health officers to thoroughly isolate patients, disinfect houses, clothing, etc,) the actual number of cases of scarlet fever per annum in Michigan is decreasing from year to year, notwithstanding the increasing population; for by comparing the deaths from scarlet fever in Michigan reported to the Secretary of State during the 5 years, 1869-73, immediately preceding the organization of the State Board of Health, with those reported during the 11 year period, 1874-84,* since the organization of the Board there is found an average of 147 less deaths per annum, or allowing for increase of population 338 less deaths per annum since the State Board of Health was established. †

---

* When these computations were made, statistics for 1885 and 1886 were not yet available.

† For more complete comparison of these periods, see Report of the State Board of Health, Mich., 1886, pp. 77-78.

TABLE.—*Exhibiting the Number of Outbreaks, Cases and Deaths from Scarlet Fever, together with the Average Number of Cases and Deaths per Outbreak and the per cent of Deaths to Cases reported to the office of the State Board of Health for each of the six years, 1882-87.*

Years.	Reported Outbreaks.	Reported Localities.	Reported Cases.	Av. No. of cases per Outbreak.	Reported Deaths.	Av. No. of deaths per Outbreak.	Per cent of Deaths to cases.
1882	....	83	849	....	138	....	*16
1883†	164	150	1,802	11	248	1.51	*14
1884‡	324	296	2,476	8	230	.71	9
1885	356	337	2,750	8	187	.53	7
1886	386	302	3,046	8.28	275	.71	9
1887	353	297	3,400	9.63	314	.89	9

*Probably in some instances only the fatal cases were reported.

†Use of the blank form "M" for weekly reports was begun in May, 1883.

‡Use of the annual reports of health officers in compiling scarlet fever for the communicable disease article was begun in 1884.

SOURCE OF CONTAGIUM OF SCARLET FEVER.

In the reports of 171 of the 351 outbreaks the source of contagium was not mentioned; in 93 it was reported unknown; and in the remaining 87 outbreaks, the disease was reported as having been traced either to its source or probable source, as follows: 6 were attributed to filth or unsanitary conditions, 5 were contracted outside of jurisdiction, 18 were indicated as probably derived from a former case of scarlet fever, and the remaining 58 outbreaks were reported as having been traced to a former case. It must be admitted that the reports of health officers on this subject are very imperfect—in nearly half of the outbreaks no report whatever is made as to the source of contagium.

Reported Source.	Outbreaks.
Traced to a former case	58
Probably to a former case	18
Contracted outside of jurisdiction	5
Unsanitary conditions	6
Unknown (includes 3 reported "sporadic")	93
Not reported	171
Total	351

Traced to a Former Case of Scarlet Fever—How Scarlet Fever is Spread.

The following are representative statements from those that have been classified as "traced to a former case," with the name of health officer and locality subjoined:

"Carried in clothing by an attendant about four weeks after a previous outbreak of the disease in a neighboring town."—*J. L. Ramsdell, health officer, Tekonsha.*

"By children in my township attending a Christmas tree in the township of Sheridan. They sat in the same seat with children who had had scarlet fever some two weeks before."—*John Gordon, health officer, Hatton township, Clare county.*

"It was introduced into this locality by the removal of. a child from a locality where it was raging."—*A. Hixson, M.D., health officer, Roxand township, Eaton county.*

"From children in Houghton school where the children from my jurisdiction were going to school."—*Alfred David, health officer, Adams township, Houghton county.*

"By visitors from Taymouth, the adjoining township, who had the disease some time before; but had not used the proper disinfectants."—*A. K. Warren, M. D., health officer, Walton township, Eaton county.*

"Child was brought here from near Grand Ledge after he complained of being sick. One had been sick in the family before they came back here."—*J. S. Jordan, clerk of Chester township, Eaton county.*

"A little girl in Olivet had scarlet fever and was not reported nor isolated. She attended a church social and held this child during the evening."—*A. K. Warren, M. D., health officer, Walton township, Eaton county.*

"By a person passing from where the disease was raging to a family in my jurisdiction, and visiting between this family and several neighboring families; later, by a child being sent to a private school before desquamation had entirely ceased."—*A. J. Lawbaugh, M. D., health officer of Osceola township, Houghton county.*

"In room occupied by patient."—*Dr. F. C. Myers, health officer, Oshtemo township, Kalamazoo county.*

"Two of the cases caught the disease in Plainwell and thus introduced it into the family."—*W. F. Sherman, M. D., health officer, Cooper township, Kalamazoo county.*

"A peddler who had been in a house where the inmates were suffering with scarlet fever."—*G. W. Stone, M. D., health officer, Metamora township, Lapeer county.*

"A case of concealed scarlet fever in the neighborhood reported last year. The children of said case mingled freely with the brothers and sisters of the present case—hence the source."—*H. A. Fortuin, M. D., health officer, Overisel township, Allegan county.*

"Patient was exposed at Tekonsha, this State, Calhoun county."—*L. A. Warsabo, M. D., health officer, Coldwater.*

"Carried in clothing by an attendant about four weeks after a previous outbreak of the disease in a neighboring town."—*J. L. Ramsdell, health officer, Tekonsha.*

"From two cases in Norwegian immigrants."—*Dr. H. A. Sifton, health officer, Sutton's Bay township, Leelanaw county.*

"Mrs. C. after visiting a family where scarlet fever then was, came from Negaunee to Michigamme. She visited the family of A. here, and in three days the oldest child, age eight, showed first signs of the disease."—*I. R. Humphrey, M. D., health officer, Michigamme township, Marquette county.*

"The first case was imported from Petrolia, Ont. The child had scarlet fever three weeks before. The next cases were from exposure to the first before isolation and before the case was seen by myself."—*Dr. O. M. Stephenson, health officer, Ft. Gratiot.*

"The case came to Port Huron on a vessel, Saturday night, and the patient, a girl nine years of age, died on Sunday night. The disease was contracted in Detroit."—*C. C. Clancy, M. D., health officer, Port Huron.*

"By lady with her children visiting Cadillac on last Christmas. The disease was contracted from Mr. W.'s family at Cadillac.—*William East, health officer, Cherry Grove township, Wexford county.*

"The children were exposed to scarlet fever at Battle Creek."—*A. Hanlon, M. D., health officer, Elk Rapids township, Antrim county.*

"The patient, G. C., was exposed to scarlet fever through J. G. (according to the best evidence I could gain), whose family at Ingham township, Ingham county, was just recovering from the disease. The two met at Grand Rapids, and came from there to Caledonia, and while here occupied the same bed at the hotel."—*J. A. Morey, M. D., health officer, Caledonia township, Kent county.*

"Child was taken to a house where scarlet fever had occurred one month previously; house was supposed to be safe, as several pounds of sulphur, etc., had been consumed with that object."—*A. J. Harris, M. D., health officer, Essexville.*

"Child's parents had been in Cleveland, Ohio, for two or three months and brought it home with them."—*C. M. Stuck, M. D., health officer, Plainwell.*

"Patient with parents came from Buena Vista, Saginaw county, Mich., during an epidemic to avoid the disease."—*Byron H. Ovenshire, M. D., health officer, Juniata township, Tuscola county.*

"I believe that in these cases the disease germs were carried in the clothing of a lady who visited this family immediately after having been exposed to scarlet fever in Decatur, Mich. Fourteen days after her visit these children came down."—*W. B. Anderson, M.D., health officer, Pine Grove township, Van Buren county.*

"Patient visited at Bangor, where 'scarlet rash' was present."—*Dr. Geo. D. Carnes, health officer, South Haven.*

"By visiting a house where washing was being done for scarlet fever patients."—*L. E. Jones, M. D., health officer Montague.*

"The patient went on a visit to her aunt s. Was there one week when taken sick. There were two little girls about the same age as the patient. They had been sick with a disease accompanied with rash. One doctor said it was Dutch measles, another said it was scarlet rash."—*W. M. Short, M. D., health officer, Talmage township Ottawa county.*

"Brought by a family from Oxford."—*Theo. Dahlman, clerk, Avon township, Oakland county.*

"Brought to this place by a family having the same from some place in northern part of the State, where they had been on a visit."—*W. A. Crandall, M. D., health officer, Nottawa township, St. Joseph county.*

"The first case was supposed to be measles by the parents of the child and was contracted while visiting in a neighboring town. All the other cases originated from that one."—*R. S. Gilbert, M.D., health officer, Sanilac township, Sanilac county.*

"A young lady came from Edmore, and attended a funeral, who had been exposed to the fever before leaving there. But one other had it then; several weeks after another family came down with it."—*Mrs. C. M. Barnes, M. D., health officer, Fairplain township, Montcalm county.*

"There had been a family in the same house, one member of which had an attack of scarlet fever about a year ago, The premises were disinfected at the time. The present family moved in about six weeks ago; the house had been vacant about four months."—*John F. Hinks, M. D., health officer, Manistee.*

"Undoubtedly from clothing that had not been thoroughly disinfected when packed away in December, 1886."—*Dr. L. D. Sunderlin, health officer, Pewamo.*

"Brought from Williamston."—*Dr. J. B. Park, health officer, Meridian township, Ingham county.*

"Visit to a neighboring town where scarlet fever was known to be."—*A. J. Harris, M. D., health officer, Hampton township, Bay County.*

"First case was brought from Chicago."—*L. A. Warsabo, M. D., health officer, Coldwater.*

"A child of Mrs. B. contracted the disease while on a visit to Toledo."—*J. B. Haynes, M. D., health officer, Dundee.*

"People visiting from Ohio."—*M. A. Jerome, M. D., health officer, Fairfield township, Lenawee county.*

"Contracted at Marquette."—*Dr. Geo. G. Barnett, M. D., health officer, Tilden township, Marquette county.*

"Disease was contracted in Detroit."—*Dr. J. M. Burgess, health officer, Northville.*

"Contracted at school from children coming from Adams township."—*H. N. Jones, M. D., health officer, Houghton.*

"From a young man from a lumber camp."—*Dr. Myron Briggs, health officer, Speaker township, Sanilac county.*

"Contagion in Sanilac county."—*Dr. E. L. Cash, health officer, Burchville township, St. Clair county.*

"From a case in an adjoining town."—*J. S. Blanchard, M. D., health officer, Parma.*

"From previous epidemic."—*John McRae, M. D., health officer, Sherman township, Keweenaw county.*

"Contracted the disease at school."—*W. B. Hathaway, M. D., health officer, Bloomingdale township, Van Buren county.*

"Exposure to the contagium."—*Dr. D. F. Brown, health officer, Eagle township, Clinton county.*

"From the school in Ovid."—*Charles B. Giffels, health officer, Victor township, Clinton county.*

"First case by infected bed."—*Joseph E. Daniels, health officer, Clarendon township, Calhoun county.*

"By a family from Chicago."—*C. W. Hawley, M. D., health officer, Gun Plain township, Allegan county.*

"From clothing of a traveler."—*James Gibbs, health officer, Benona township, Oceana county.*

Outbreaks Probably Traced to Former Cases.

"All that I can find out is that a lady came from Bear Lake, where they had the scarlet fever, and slept with the child, and took some clothing out of her valise and worked on it in the room; but we do not know that she was exposed before coming here."—*Dr. Isaac Voorhies, health officer, Frankfort.*

"From a boy who went from Allen to Chicago. While there had what the physician called German measles; but from no other cause that we know of, we had six cases."—*H. W. Whitmore, M.D., health officer, Allen township, Hillsdale county.*

"The first case was G. H. It is not known how she took the disease unless being exposed at Toledo about three weeks previously.—*A. S. Austin, M. D., health officer, Fowlerville.*

"It is hard telling how the disease was introduced, as it has been in Filer City, Manistee, and Manistee township before it came to my jurisdiction, that is from one to five miles from here, and there is a stage running here from Manistee."—*Nicholas C. Welbes, health officer, Stronach township, Manistee county.*

"The disease came from Menominee City according to statements of various persons."—*Dr. John R. Williams, health officer, Ingallston township, Menominee county.*

"The family in which the disease first made its appearance had received clothing some time previously from relatives living in Detroit who had had the disease about two years ago."—*Dr. E. A. Chapman, Commerce township, Oakland county.*

"Family had been visiting in Detroit. Four or five days subsequently the symptoms appeared, and we suppose the disease came from that source."—*Dr. S. D. Holcomb, Southfield township, Oakland county.*

"So far as can be learned the first two cases were exposed on a D., G. H. & M. R. R. train about Sept. 26, 1887."—*Dr. A. M. Hume, health officer, Owosso.*

"Was doubtless brought from Detroit in clothing of a person who visited a hospital in that city the day before visiting the family in which the first case occurred."—*Dr. H. B. Bassac, health officer, Milan.*

Attributed to Unsanitary Conditions.

The following are representative statements concerning source of contagium which, in the preceding table, are classified under "unsanitary conditions"

"The ground is clay and spongy or springy. The cellar stands half full of water all the time, and the disease is supposed to have originated there." —*T. J. Royal, health officer, Casco township, Allegan county.*

"Contaminated wells and cesspools."—*Dr. John W. Caughlin, health officer, Bay City.*

"From filth in the cellar."—*John C. Brown, M. D., health officer, Burlington township, Calhoun county.*

MEASURES TAKEN TO RESTRICT SCARLET FEVER.

The following are representative statements of health officers who reported quite fully that they enforced strict isolation and thorough disinfection:

A. S. Austin, M. D., health officer of Fowlerville, in reporting the measures which he employed in restricting an outbreak of scarlet fever which occurred in his jurisdiction May 3, 1887, and which was restricted to three cases and one death, stated substantially the following:

> Patients were isolated from all other people except nurse and physician. The discharges passed in the room were disinfected by sulphate of copper, and the rags used about the patient were burned. The clothing was disinfected by sulphate of zinc. The contents of the privy-vault were disinfected by sulphate of iron and chloride of lime. All the rooms in the house were disinfected with the fumes of 5 lbs. of burning sulphur and with chloride of lime.

Concerning the measures taken to restrict an outbreak of scarlet fever which occurred in Keller township, Van Buren county, July 30, 1887, and which was restricted to one case, the health officer, C. R. Dewey, M. D., reported substantially the following:

> A notice was posted on the house. The patient was kept isolated from all other people except nurse and physician. The discharges were constantly disinfected in zinc solution and then buried. The clothing was disinfected in zinc solution and by dry heat. All rooms in the house were disinfected by the fumes of 9 lbs. of burning sulphur which was about 3 lbs. per 1,000 cubic feet of air space.

An outbreak of scarlet fever occurred Feb. 23, 1887, in Weare township, Oceana county, which was restricted to one case. The health officer, A. L. Carr, reported the measures taken to stop the spread substantially as follows:—

> The family has been isolated from the public, and the patient was isolated from all other people except the nurse and physician. The discharges passed in the room and the contents of the privy-vault were disinfected by sulphate of zinc and copperas. Light clothing was disinfected by zinc solution and the heavy clothing by fumes of burning sulphur. All rooms were fumigated by 6 lbs. of burning sulphur, which was about 3 lbs. per 1,000 cubic feet of air space.

Concerning the measures taken to restrict an outbreak of scarlet fever which occurred in the village of Whitehall, Feb. 14, 1887, and which was restricted to a single case, the health officer, C. E. Walters, M. D., reported substantially the following:—

The patients were kept isolated from all other people except the nurse and physician. The discharges passed in the room and the contents of the privy-vault were disinfected by chloride of lime. All rooms in the house and the clothing were disinfected by the fumes of 7 lbs. of burning sulphur.

Dr. Geo. D. Carnes, health officer of the village of South Haven, in reporting the measures which he employed in an outbreak which occurred Feb. 18, 1887, in his jurisdiction and which was restricted to one case, stated in substance the following:—

The house was placarded. The patient, a woman 50 years of age, and her nurse were confined in an upper room far removed from the rest of the family, and isolated from all other people except nurse and physician. The sick room and hall were tightly closed and, together with the clothing, was fumigated with 4 lbs. of burning sulphur.

Quite a number of health officers described at length a thorough use of disinfectants; but regarding isolation simply reported "house placarded," "sign put up," "notices given to the public," and similar statements, thus leaving in doubt whether the public were prohibited from intercourse with the family, and whether the patient was isolated from all except nurse and physician.

Also a large number reported isolation thoroughly enforced; but did not mention the use of disinfectants. A few stated that neither isolation nor disinfection was enforced, and quite a large number indicated that either one or the other was neglected. Also quite a large number were entirely silent on measures of restriction.

TRANSGRESSION OF PUBLIC HEALTH LAWS.

C. A. Norconk, M. D., health officer of Bear Lake township, Manistee county, concerning an outbreak of scarlet fever in his jurisdiction, reported thorough disinfection; but to the question, "Were the patients kept isolated from all other people except nurse and physician?" he replied: "Not all." In this outbreak there were reported 25 cases and 6 deaths.

Concerning an outbreak in Osceola township, Houghton county, Nov. 28, 1887, the health officer, A. J. Lawbaugh, M. D., reported:—"A child was, against orders, sent to school before desquamation was finished and in one week 6 new cases arose. The children in the same seat were all taken with the disease." In this outbreak there were reported 19 cases and 3 deaths.

David Ralston, M. D., health officer of Davison township, Genesee county, in his final report of an outbreak in his jurisdiction, replied to the question, "Were the patients kept isolated from all other people except nurse and physician?" as follows: "As much as possible. All visitors were excluded except those necessary to nurse the patient. In some cases these rules were violated by families." There were reported 16 cases and 2 deaths in this outbreak.

A. S. Haskins, M. D., health officer of the township and village of Lawrence, Van Buren county, in his final report of an outbreak in his jurisdiction, makes no report of having enforced any measures whatever for restricting the spread of the disease. He states as follows: "The disease was in a mild form; so much so that the people could not be induced to take any preventive measures; yet some of them had it quite severe." There were reported in this outbreak 75 cases and 1 death.

Concerning an outbreak of scarlet fever in the village of Plainwell, the health officer, C. M. Stuck, M. D., reports having carefully isolated the patients; but regarding the disinfection of rooms he reports the following: "The quantity of sulphur burned was two ounces twice a day." This seems to imply that this insignificant amount of sulphur was burned in the room during its occupancy by the patient. In the document issued by this Board on the restriction and prevention of scarlet fever, the first sentence under the head of disinfection is as follows: "Aerial disinfection or fumigation can be completely and entirely effectual only in the absence of living persons, as heat or fumes strong enough for the purpose are destructive of human life." Regarding the amount of sulphur necessary it is there stated: "For a room about ten feet square, at least three pounds of sulphur should be used; for larger rooms, proportionately increased quantities, at the rate of three pounds for each 1,000 cubic feet of air space." In the above outbreak there were reported 54 cases, but no deaths.

PRACTICAL RESULTS IN RESTRICTING SCARLET FEVER.

The following table and diagram exhibit some of the practical results of the efforts at restricting scarlet fever in Michigan during the year 1887.

The table on page 249 is compiled from the reports, letters, etc., of local health officers, and the diagram is constructed from the figures given in the table.

The first double column, marked "(1)" in the table, shows the average number of cases and the average number of deaths in all (299) outbreaks* (excluding Detroit and Grand Rapids, where the disease was reported present each week during the year, and we have no knowledge of how many distinct outbreaks owing their origin to different sources of contagium occurred). The second double column gives the average number of cases and the average number of deaths in 190 outbreaks in which isolation and disinfection were not mentioned, or concerning which the statements were of doubtful meaning. The third double column exhibits the average number of cases and the average number of deaths in the 45 outbreaks in which isolation and disinfection or both were neglected. The fourth double column shows the average number of cases and the average number of deaths in 64 outbreaks in which isolation and disinfection were both enforced.

---

* Whenever a break of 60 days or more has occurred in the progress of scarlet fever it has hitherto been regarded as two different outbreaks, but in estimating outbreaks for this table and the corresponding table for diphtheria, if the second appearance of the disease originated from the first the intermission was disregarded and it was treated as a single outbreak. Also, comparisons of *years* require that outbreaks be counted as closed at the close of the *year*; while in comparing *outbreaks* for testing the value of isolation and disinfection it is necessary to take *complete outbreaks*, even where they extend from one year into the next. This explains the apparent discrepancy between the number of outbreaks here given and the number given at the beginning of this article.

TABLE.—*Scarlet Fever in Michigan in 1887: Exhibiting the Average Number of Cases and Deaths per outbreak:—(1) in all the 299 outbreaks reported, (2) in the 190 outbreaks in which it is doubtful whether or not Disinfection and Isolation were secured, (3) in the 45 outbreaks in which Isolation or Disinfection, or both, were neglected, and (4) in the 64 outbreaks in which Isolation and Disinfection were both enforced. Compiled in the office of the Secretary of the State Board of Health, from reports made by local health officers.*

	(1) All Outbreaks.* (299 Outbreaks.)		(2) Isolation or Disinfection not Mentioned or Statements Doubtful.† (190 Outbreaks.)		(3) Isolation or Disinfection or Both Neglected. (45 Outbreaks.)		(4) Isolation and Disinfection Both Enforced. (64 Outbreaks.)	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Totals	1,882	141	1,200	93	534	37	148	11
Averages	6.29	.47	6.32	.49	11.87	.82	2.31	.17

* Reports of scarlet fever in the cities of Detroit and Grand Rapids are not included because of the difficulty of determining the beginning and ending of an outbreak in these cities, in which the disease is present in some part of the city throughout the year.

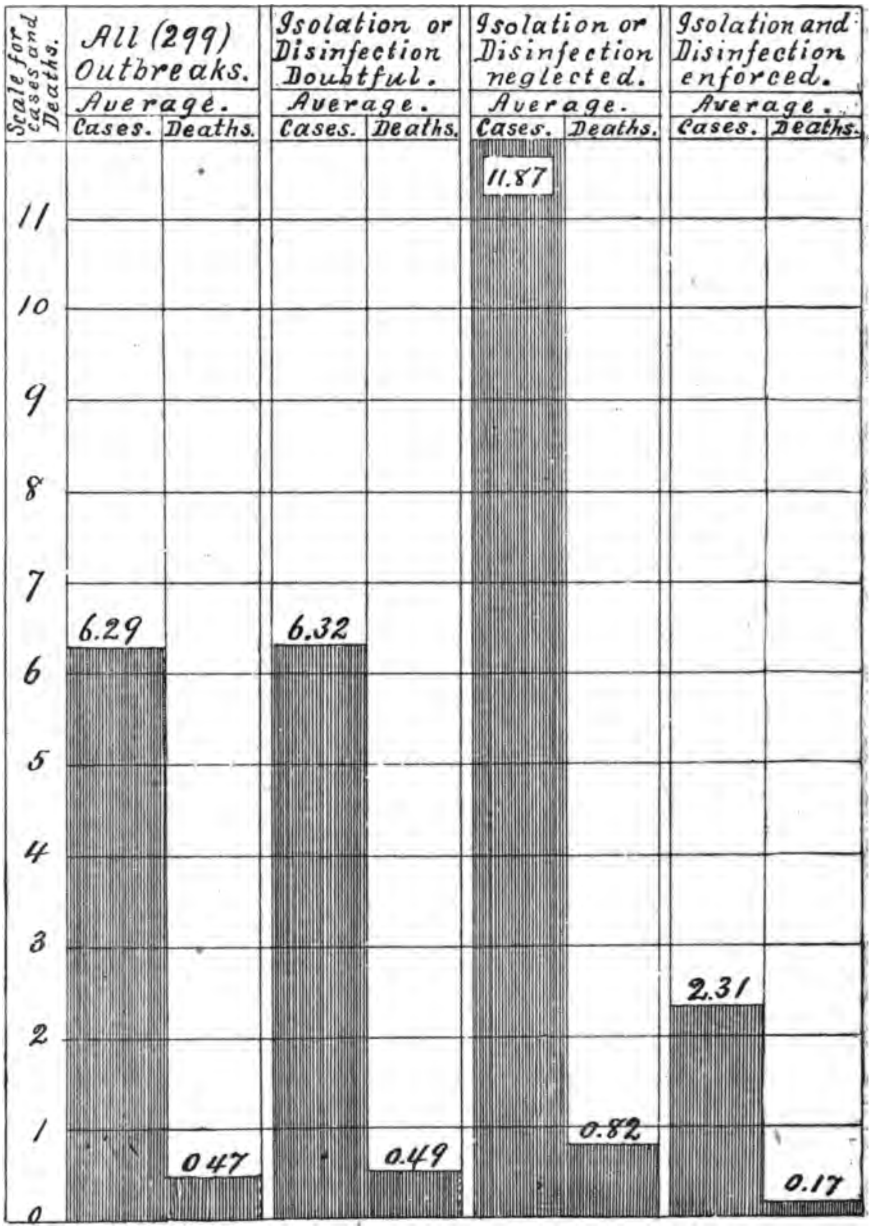
† There were quite a number of outbreaks in which isolation and disinfection appeared almost certainly to have been enforced; but, as this was not absolutely certain, they were put in this "doubtful" column; usually the doubt was only concerning one of the measures, the other having been thoroughly enforced. This accounts for the averages in this double column being so low. All cases and deaths, concerning which clear and positive statements were made by health officers, are included in the columns marked (3) and (4).

As shown in the table, all outbreaks reported were 299, in which there were 1,882 cases and 141 deaths, making an average of 6.29 cases and .47 deaths per outbreak. In 190 outbreaks where isolation or disinfection were not mentioned, or the statements were of doubtful meaning, there were 1,200 cases and 93 deaths, making an average of 6.32 cases and .49 deaths per outbreak. Also, in 45 outbreaks in which isolation or disinfection or both were neglected there were 534 cases and 37 deaths, averaging 11.87 cases and .82 deaths per outbreak, while in 64 outbreaks in which isolation and disinfection were both enforced, there were 148 cases and 11 deaths, or an average of only 2.31 cases and .17 deaths per outbreak, indicating a saving of 9.56 cases and .65 lives per outbreak, or some 612 cases and 41 deaths in the 64 outbreaks by isolation and disinfection. Furthermore, if in all the 299 outbreaks there had been no restrictive efforts, and the averages had remained the same as in the 45 outbreaks in which we know isolation or disinfection was neglected, the total cases would have been 3,549, and the total number of deaths would have been 245. Deducting the cases (1,882) and the deaths (141) which really occurred despite all the restrictive measures, and there is indicated a saving of 1,667 cases and 104 lives by these restrictive measures during the year 1887.

By a similar comparison made in the Report for 1886, pages 222-224, there is shown, for that year, a saving of 2,768 cases and 230 lives from scarlet fever by isolation and disinfection. This makes for the two years, 1886 and 1887, a saving of 4,435 cases and 334 lives from this one disease.

On pages 235-236 of this Report it may be seen that for these same two years, 1886-1887, there were saved by these restrictive measures in diphtheria 6,745 cases and 1,351 lives.

Scarlet Fever in Michigan in 1887, exhibiting the Average Numbers of Cases and Deaths per outbreak:-(1) in All the 299 outbreaks Reported; (2) in the 190 outbreaks in which it is Doubtful whether or not Disinfection and Isolation were secured; (3) in the 45 outbreaks in which Isolation or Disinfection or both were neglected; and (4) in the 64 outbreaks in which Isolation and Disinfection were both enforced. (Compiled in the office of the Secretary of the State Board of Health from reports made by local health officers.)



It thus appears that in the two diseases, scarlet fever and diphtheria combined, in the two years, 1886-1887, 11,180* cases were prevented and 1,685 lives were saved in the State of Michigan by these preventive and restrictive measures.

For the local boards and health officers who faithfully and vigorously enforced restrictive measures, the above showing of their preventing sickness and saving life is good cause for congratulation, and those who were negligent of duty will find in this evidence powerful exhortation to diligence in preventing and restricting these diseases in the future.

PERIOD OF INCUBATION OF SCARLET FEVER.

There is much difficulty in determining the exact period of incubation of scarlet fever. Often the exact date of exposure is uncertain, and, if the time of exposure is known, the poison may be carried in the clothing or hair for some time before it becomes introduced into the system. Also in this disease the primary fever is sometimes so slight as to escape notice.

Forty health officers made more or less definite statements regarding the period of incubation. The following are reports of eight health officers concerning the period of incubation, with the names of health officers and localities subjoined:

"In 7 days from the first case the second case occurred, and in about 10 days the third, near by."—*Dr. Harvey J. Chadwick, Hart township, Oceana county.*

"The first case and, in fact, all were 7 and 8 days."—*G. W. Stone, M.D., Metamora township, Lapeer county.*

"On Jan. 7 a girl came down in school with it; in 6 days two others came down; in 8 days two more came down, and in 13 days one more, all having been exposed on Jan. 7. The first case was exposed at the Christmas tree Dec. 25, 1886."—*John Gordon, Hatton township, Clare county.*

"Exposed, as we think, on Saturday and showed evidence of the disease on the following Friday."—*J. L. Ramsdell, M. D., Tekonsha township, Calhoun county.*

"A child was sent to school, against orders, before desquamation was finished; in 7 days after, the scholars occupying the same seat were all taken with the disease."—*A. J. Lawbaugh, M. D., Osceola township, Houghton county.*

"Of the first case nothing is known. Of the second, both girls met at school, and case number two succumbed in 6 days."—*A. J. Harris, M. D., Hampton township, Bay county.*

"The [two] children were exposed to the contagion about a week and 10 days respectively before the rash began to appear."—*A. Hanlon, M. D., Elk Rapids township, Antrim county.*

"The second patient came down in just a week from exposure."—*Thomas J. Royal, Casco township, Allegan county.*

The substance of the statements of the forty health officers who reported somewhat definitely concerning the period of incubation of scarlet fever in their respective jurisdictions in Michigan during the year 1887, is exhibited in the two following tables:

---

*As the double column showing outbreaks where "isolation or disinfection or both were neglected" includes quite a number of outbreaks where either isolation or disinfection was enforced, or one or both enforced in part of the cases, it is evident why the averages in these columns are not nearly so great as they would have been if no efforts whatever had been made to stop the spread in these outbreaks. For this reason it is plain that the figures here given do not show nearly all of the cases and deaths prevented by isolation and disinfection.

TABLE.—*Exhibiting the Reported Period of Incubation, in Days, for Scarlet Fever, in twenty-three instances. Compiled from reports of Health Officers, relative to the year 1887.*

	Period of Incubation, stated in Days.										
	3	4	5	6	7	8	9	10	14	20	30
Instances in each period.........	6	0	2*	2	5	2	1	2	1	1	1

* In one of these cases it was reported as "about five days."

The average length of the period of incubation, for the 23 instances, is 8 days.

TABLE.—*Exhibiting relative to eighteen instances of Scarlet Fever in Michigan in 1887, the Reported Period of Incubation within certain limits, stated in days; also the Means, the average of which may represent the average Period of Incubation.*

Days (in six instances).	Means.	Days (in six instances).	Means.	Days (in six instances).	Means.
1 to 4	2.5	3 to 6	4.5	5 to 22	13.5
1 to 8	4.5	3 to 10	6.5	6 to 14	10.
2 to 4	3.	4 to 7	5.5	7 to 8	7.5
2 to 8	5.	4 to 9	6.5	7 to 10	8.5
2 to 14	8.	5 to 6	5.5	7 to 10	8.5
2 to 42	22	5 to 15	10.	7 to 10	8.5

The average of the means, in the above mentioned eighteen instances, is 7.8 days.

HOW LONG WILL THE CONTAGIUM OF SCARLET FEVER CONTINUE ACTIVE?

Dr. J. L. Ramsdell, health officer of Tekonsha township, Calhoun county, reported the following concerning the contagium: "Carried by an attendant in clothing about four weeks after a previous outbreak of the disease in a neighboring town."

Concerning the source of contagium of an outbreak, on August 21, 1887, in his jurisdiction, Dr. L. D. Sunderlin, health officer of Pewamo, reported the following: "Undoubtedly from clothing that had not been thoroughly disinfected when packed away in December, 1886." This indicates that in this instance the contagium continued active for over eight months.

Dr. E. A. Chapman, health officer of the township of Commerce, Oakland county, reported as follows: "Learned that the family where the disease first made its appearance had received some clothing, some time previous, from relatives living in Detroit who had had the disease about two years ago. The above is the only source of contagium learned of."

TYPHOID FEVER IN MICHIGAN DURING THE YEAR ENDING DEC. 31, 1887.

This article continues the history of typhoid fever in Michigan, begun in preceding Reports. It deals with the facts reported bearing upon typhoid fever as a *communicable* disease, "dangerous to the public health."

TYPHOID FEVER AND LOW WATER IN WELLS.

Connected with the peculiar manner in which typhoid fever seems to be spread—through the discharges from the bowels of the patient reaching the intestine of the next victim—there are facts relative to general conditions throughout the State which are carefully gathered by the State Board of Health, and which it is believed will be of very great value in teaching how typhoid fever may be largely prevented. Such facts are from sources quite different from those from which have come the facts included in this paper. Such facts relate chiefly to the *depth of water in wells*, the *depth of the ground water* generally, and the *rainfall* to which the low water in wells has close relations. In the Annual Report of this Board for the year 1884, pp. 89–114, there was published an article which contained some of the evidence then collected. In the first part of this Report, pages lv.–lvii. there is some later evidence, brought up to the close of the year 1887. It may well be studied in connection with this article. The three tables there given may be summarized so far as relates to years, in one table, as follows:—

Relation of Sickness from Typhoid Fever to the Rainfall and the Height of the Ground Water in Michigan.

Year and Period of Years.	Average Monthly Rainfall.	Average Inches of Earth above the Ground Water.	Average Per Cent of Weekly Card Reports stating presence of Typhoid Fever.
Av. 10 years, 1878-87	3.08	*244	12
Av. 9 years, 1878-86	3.16	†242	11
1885	2.92	242	‡ 8
1886	2.68	242	8
1887	2.41	253	10

* This average is only for three years, 1885–87.
† This average is only for two years, 1886-87.
‡ Since May, 1885, physicians have reported only the prevalence of diseases under their *own observation*. Previous to that time diseases that were *believed* to be present were so reported. This may account for a part of the sudden decrease in 1885 and 1886 as compared with the preceding years.

From this table, it may be seen that the rainfall in 1886 was less than the average, but that the ground water did not seem to change; that the rainfall was still less in 1887, and the ground water was lower than the average, and that the typhoid fever was one-fourth more than in the two preceding years. (The typhoid fever in 1887 cannot profitably be compared with the long averages, because of the change in the method of reporting the sickness which occurred early in the year 1885.)

TYPHOID FEVER IN MICHIGAN DURING 1887 COMPARED WITH PRECEDING YEARS.

Since the beginning of the year 1886 more systematic effort has been made to obtain a complete history of each outbreak of typhoid fever in Michigan of which any information has reached the office of the State Board of Health. Upon receipt of such information from any source, a letter has been sent to the health officer of the township, city or village in which the outbreak was reported, urging prompt action in restricting the disease, and asking for a weekly report of progress. Copies of a pamphlet on the restriction and prevention of typhoid fever were sent for distribution to the neighbors of the family sick with the disease.

There were reported during the year ending Dec. 31, 1887, 335 outbreaks of typhoid fever in 320 localities, with 2,424 cases and 411 deaths. The following table gives the number of outbreaks, localities, cases and deaths reported, the average cases per outbreak, the average deaths per outbreak, the per cent of deaths to cases, and the number of final reports received concerning typhoid fever during each of the years 1884–1887.

TABLE 1—Typhoid Fever.—*Exhibiting the number of Outbreaks, Localities, Cases and Deaths reported for each of the years 1884, 5, 6, and 7; also, for some of those years, the average Cases and Deaths per Outbreak, the Per Cent of Deaths to Cases, and the number of Special Final reports received.*

Years.	Outbreaks Reported.	Localities Reported.	Cases Reported.	Deaths. Reported.	Av. Cases per Outbreak	Av. Deaths per Outbreak	Per cent of Deaths to Cases.	Final Rept's Received.
1884	....	245	969	290	....	....	27	....
1885	218	200	715	194	3.28	.89	23	....
1886	290	282	1,194	282	4.15	.75	18	60
1887	335	320	2,424	411	7.24	1.23	17	46

It will be noticed from this table that the average number of cases per outbreak and the average number of deaths per outbreak are much larger in 1887 than in 1886. The large averages in 1887 are largely due to the outbreak at Iron Mountain, in which there were 300 cases and 45 deaths, and to the outbreak in Manistee in which there were 235 cases and 28 deaths However, as since early in 1886 special attention has been directed to this disease by the State Board, and as the facts are being more carefully collected each year, it is probable that health officers are taking more pains to secure the entire number of cases; and the larger per cent of cases and deaths to the outbreak in 1887 may be due to the fact that more attention was given to this disease, and many cases were reported which formerly would have escaped notice.

But this would not have much effect upon the reports by means of the postal card weekly reports of sickness under the observation of the reporters, and the weekly card reports received at this office indicate that typhoid fever was more prevalent in 1887 than in either of the previous 2 years, 8 per cent of all reports received in 1885 and 1886 stating the disease to be present, and ten per cent of the reports received in 1887 so stating.

This subject is dealt with in another part of this Report, on pages lv-lvii., and it seems probable that the increased typhoid fever in 1887 may have been due, in part at least, to the low water in wells in that year, it being the third year of small rainfall. A summary of the facts respecting rainfall, ground water, and typhoid fever may be seen in the table on page 253 in this article.

SOURCE OF CONTAGIUM IN TYPHOID FEVER.

The following table gives a concise statement of the source of contagium reported by health officers; also the number of outbreaks where the source was not stated.

TABLE 7.—*Exhibiting the reported "Source of Contagium" of Typhoid Fever in Michigan during the year 1887.*

Reported Source of Contagium.	Number of Reports for each Source of Contagium
Infected or impure water	57
Supposed to be bad water	10
"Low water in wells"	6
Bad sanitary surroundings	10
"Filth"	1
Defective drainage	4
"Foul air"	2
"Attending the sick"	3
"From taking cold"	5
"Malaria"	3
"Overwork"	5
From outside of jurisdiction	36
Unknown (including "Sporadic" 1, "Epidemic" 2)	44
No source stated	143

Some of the more extended statements as to source of contagium are as follows:

The following interesting letter from Dr. H. McColl, health officer of Lapeer, shows how typhoid fever was spread in that city:

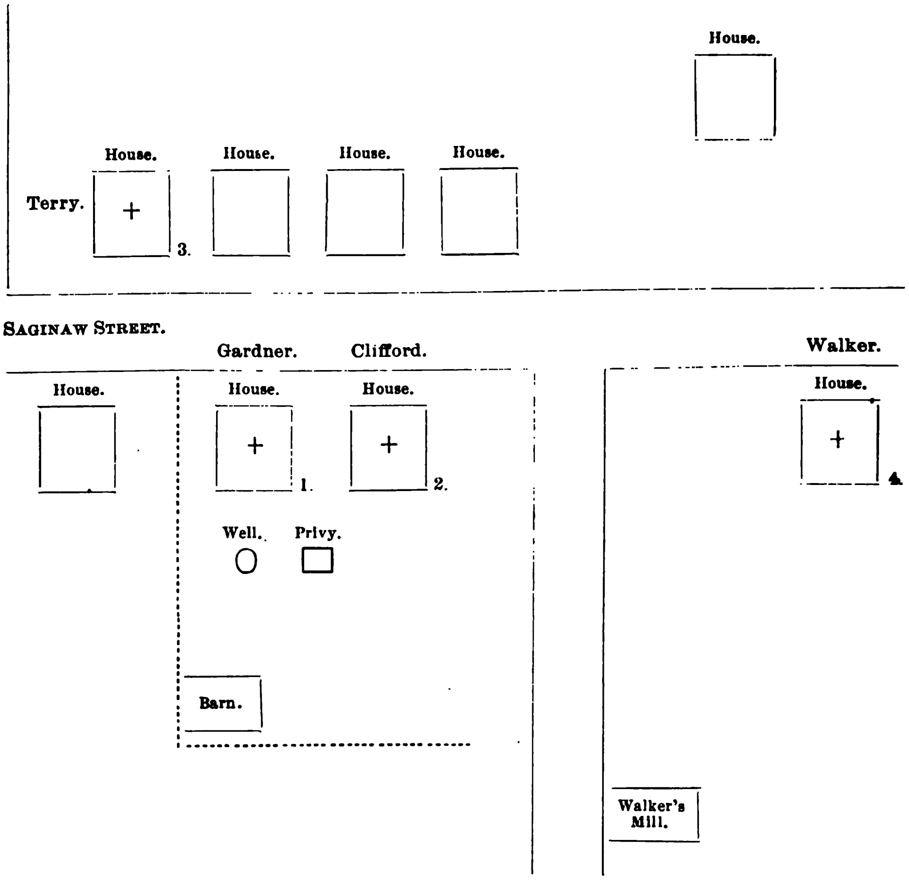
Typhoid Fever cases in Lapeer City, with sources of contagion.

LAPEER, MICH., Oct. 31, '87.

Dr. Baker: Enclosed find a short report of typhoid cases occurring in the southern part of our town. Houses marked + are the ones in which cases occurred. Nos. 1, 2, 3 and 4, order of outbreak. Cases in 2, 3 and 4 traceable to water from well in rear of No. 1.

Respectfully,

H. McCOLL.



About September 1, '87, Myron Gardner, railroad employé, came from the south sick with fever to his father's home, No. 1 on diagram. His case was supposed to be malarial. No care was exercised with stools in the way of disinfection, but they were thrown into privy vault in rear of house, and in close proximity to well. Wash water was thrown on the surface of the ground which was very dry at the time. About 7th or 8th of Sept. a copious rain fell and soaked the sandy soil; and on the 14th William Gardner and wife, father and mother of Myron and E. D. Gardner, a brother (who was a student in my office) and who boarded at home, were attacked with fever. On this day I got home from Washington, and found four of them down with a severe type of typhoid fever, and in 2 weeks Myron's wife and child were attacked. Also a child across the street at Terry's who had used water from the Gardner well. About the same time, 3 cases in the Clifford house south of Gardner's, who also used water from the Gardner well. None of the people from either of these houses were in the Gardner house. In the Walker house, still farther south, one case has occurred, and I was at a loss to account for this case till a few days ago when the young man said that at the mill where he was working they had used the Gardner water for a few days, owing to disarrangement of the pump at the mill. Two others of the mill hands—Anderson and Lester—who used the same water were attacked about the same time. Lester is now convalescent. Anderson is dead, as also the child at Terry's. When I took charge of the cases I ordered the discontinuance of water from the Gardner well, and the disinfection of the stools, and no new cases are now reported. People who assisted to take care of the Gardner and other families, and who use water from other sources have not been attacked. Clearly Myron Gardner brought the fever home, the well became infected after the first rain from slops and privy, and the other cases got their seed from the water.

Yours truly,

H. McCOLL.

Typhoid at Iron Mountain; Source of Contagium and Cause of Spread.

Oct. 15, 1887, information reached the office of the State Board of Health of an outbreak of typhoid fever at Iron Mountain, Mich. It was stated that there were then about 100 cases. Pamphlets were sent from the office of the State Board to all the prominent doctors, lawyers, ministers, keepers of hotels and boarding houses and others. Extracts from this pamphlet were copied by the Menominee Range, published at Iron Mountain. In all there were about 350 cases in this outbreak, of which about 10 per cent terminated fatally.

As to the source of contagium of this epidemic, Dr J.A. Crowell states: "The fever was brought to the village by a man from a railroad construction camp. This man died a few days after his arrival. The symptoms were very variable. In some they were typical from beginning to end, but in others they were very irregular. Constipation for the first ten days and frequently throughout the whole course of the disease existed in half the cases; and the abdominal symptoms, pain, tenderness, tympanitis, gurgling in the right iliac fossa, although certainly present in many cases, were conspicuously absent in a very large number. Intestinal hemorrhage occurred quite frequently and was the cause of death in one case in which we could never find any elevation of temperature. A subnormal temperature was very frequently observed, not only in the start, but throughout the disease. Failure of heart power, perforation, hemorrhage, pneumonia and meningitis, in the order named, were the causes of death. In only one case could we get an autopsy. It was one in which the symptoms were least like typhoid. The temperature was low, and there were no abdominal symptoms and no diarrhœa; yet the ilium was darkly congested, there were ulcerations of Peyer's patches, and, although no perforation could be seen, when the gut was inflated, it slowly collapsed."

How typhoid fever, when thus introduced, found a favorable nidus for its rapid spread may be seen from the following editorial in the Menominee Range of Oct. 27, 1887:—

> "Since typhoid fever has been raging so extensively the past two months, physicians have been inquiring into the location of the wells that supplied the water for family use, and the ignorance displayed in hygienic principles seems incredible. For instance, it was ascertained in one case where the family was suffering from typhoid fever, that the well was located within three feet of a private vault in constant use, and the husband and father, when told by the physician that they must not use that water, could not see why it was not all right, because the vault was only ten feet and the well twenty feet deep. At another place it was ascertained that a well had actually been driven in a privy vault that had been used by the former occupants of the premises. It was a nice easy place

to drive a well so they drove it there! Is it to be wondered at that the family furnished business for the doctors? At a certain boarding house the well was so located as to receive the drainage of all the slops thrown out of the kitchen and before the cause of the trouble was discovered and the well ordered closed by the physician, twenty cases of typhoid fever occurred in that house. One man, whose house and lot is on a hillside, was building his outhouse on the highest point on his lot and sinking a well twenty-five feet away and the surface fifteen feet lower than where the outhouse was to stand. His wife was just recovering from a severe attack of typhoid fever, and his physician put a flea in his ear that caused him to reverse the order of things. Wherever it is possible some men seem possessed to place the outhouse on the highest point." * * * * * * * *

A sample of the drinking water, used by some of the families in which the disease occurred, was sent to Prof. V. C. Vaughan, M. D., member of the State Board of Health, and thorough tests were made. That this Iron Mountain water contained the typhoid bacillus Dr. Vaughan demonstrated by microscopical examination, by the potato culture, and by biological experiment. Sterilized meat preparations innoculated with this bacillus and injected in the abdominal cavity of a cat produced a rise of temperature of four degrees in 24 hours. [An account of these interesting experiments is contained in the first quarterly report of the Michigan State Laboratory of Hygiene, printed in the Annual Report of this Board for 1887, on pages 2–13. Further experiments with this germ by Dr. Vaughan are mentioned on pages xlvi–xlvii of this Report.]

Dr. L. Van Amburg, health officer of Bowne township, Kent county, wrote concerning six cases of typhoid fever in one family in Aug.-Dec., 1887:

"I examined premises and concluded that the water had been the means of introducing the poison into this family. The close proximity of well to surrounding buildings, lay of land, etc., confirmed my belief. I ordered the family to stop using this water, and a new well was made in a more healthy location. Disinfectants were ordered and, on account of poor accommodations, chloride of lime was about the only one we could use to advantage. The disease continued in this family about 15 weeks. It was impossible to secure any one to act as steady nurse in the community, patients suffering greatly for care. One case terminated fatally during second week, boy aged 5 with lung complication (pneumonia). I have taken this opportunity to furnish you with this explanation which I think is only a link in the long chain of testimony, proving that this disease originates from water contaminated with decomposing organic matter.

Dr. Van Amburg also states that the distance from the well to the privy was about 30 feet, that the well was

"Originally dug, stoned and left open, afterwards converted into drive well and filled with dirt up half way, depth of well about 30 feet, surface of land sloping from house to privy and well and from barn to well." "The privy had no vault, contents were deposited on top of ground, and at times removed."

Dr. W. E. Vanande, health officer of Brookfield township, Eaton county, under date of Oct. 17, writes concerning a case of typho-malarial fever in a chore boy at his house that he

"Was not away anywhere. The ground around the village here is low, and the wells only about 8 or 9 feet deep Several weeks before he was taken, I had a sister come from Stanton, Montcalm county, to my house with a fever of doubtful diagnosis. She had just lost a son there a few weeks previous with typho-malarial fever. Hers seemed more like a hectic fever."

Dr. Mason W. Gray, health officer of Pontiac, writes concerning nine cases with one death from typhoid fever in his jurisdiction:

"In every case with one exception, the cases seemed to be due to the use of bad well water, the exceptional case occurred in the person of a young man who had drank water only from an artesian well, and had not been, so far as could be ascertained, near any cases of typhoid fever, but had done some work in an old sewer a short time previous to the onset of the disease. His was a well-marked case."

Tyler Hull, M.D., health officer of Windsor township, writes concerning an outbreak of typhoid fever in which there were "perhaps 30 cases or more" and three deaths:

"I suppose perhaps that it was caused by contaminated drinking water, as the well from which the family get their water is only about 30 feet from family privy."

The Gogebic Iron Spirit, published at Bessemer, for Oct. 1, 1887, states:

"A dozen or more persons are now confined to the hospital with the dread typhoid fever, and it is said that there are nearly thirty cases of the disease in town. We have brought all this upon ourselves by utterly neglecting all sanitary regulations. The stench which arises to heaven from our polluted cess-pool has incurred the anger of God and excited the frenzy of the devil. This condition of things is terrible to contemplate."

Dr. W. J. Herrington, health officer of Port Austin, writes concerning the first four cases in an outbreak of typhoid fever in which there were 7 cases:

"One patient has been ill a week, the others all were attacked within six days of the beginning of the illness of the first. There has been no typhoid fever within three miles of this place in at least five years. I cannot discover any source of infection except that the well from which they got the water used in drinking, etc., is filthy; a large number of cattle standing around it at intervals during the summer. Evidently all were infected from the same soucre. The cases are not well-marked."

Other reports were received as follows:—"Conductor on a construction train drank bad water at some place on the M. C. R. R., where he had to stop off;" "The first case worked at a saw mill where there are many transients; all for a time drank pond water; as soon as this man was taken sick most all carried oat meal water from home and drank that instead;" "First patient was at Vassar, Tuscola county, Mich., where the disease was quite prevalent at the time, while the fair was in progress, and returned home sick;" "The disease was brought in from Tuscola county by a young man working in a lumber camp;" "Undoubtedly from some obscure connection with the water-supply which was very low;" "I have reason to believe that the poison was absorbed into the person's blood from drinking impure well-water; well has recently been cleaned—other members of the family had symptoms of fever;" "The patient while away from my jurisdiction visited a relative supposed to have typhoid fever, and thereby probably contracted the disease."

PERIOD OF INCUBATION OF TYPHOID FEVER.

So far very few facts have been reported by health officers concerning this important question. This is probably due in great part to the difficulty in discovering just when the specific poison enters the system. Some health officers who reported outbreaks of typhoid fever during the year 1887 did not answer this question, some stated that they had no facts. One health officer reported that the patient "visited her nephew [sick with the disease], stopped over night, ate four meals at his house and returned home. In about ten to fourteen days began feeling ill, case diagnosed typhoid shortly after." One health officer writes, "Two persons were taken sick (one five, one seven days) after first sitting up with one case." One health officer reported, "Apparently an indefinite length of time was occupied in the period of incubation, as patient had not been feeling well for many weeks before. He was sailing at the time of attack, and came from Saginaw one week after being taken. Died, one week after coming home, of perforation of the bowels." Other reports were received as follows: "The four cases contracted the disease in the same house. The period of incubation was from five to seven weeks;" "The first case occurred about Oct. 1, 1887; the second case occurred Oct. 27, 1887; the third case in the same family occurred about Dec. 15, 1887;" "Woman nursed her daughter for a few days at Ironwood, Mich. Daughter had typhoid fever. Woman, becoming slightly ill, came home to Negaunee, and in five weeks died of the disease."

From what is known of the disease, the average period of incubation is probably about 11 days.

AVERAGE DURATION OF TYPHOID FEVER.—FATAL AND NON-FATAL CASES.

TABLE 2.—*Exhibiting, by Sex of Patient, the Average Duration (in days) of fatal cases of sickness from Typhoid Fever, in Michigan, during the Year 1887. Compiled from those reports which stated the length of time the patient was sick.*

Fatal Cases of Typhoid Fever.	Duration of Sickness,—in Periods of Days.											Number of cases included in this table.
	All Cases.	Under 10 Days.	10 to 15.	15 to 20.	20 to 25.	25 to 30.	30 to 35.	35 to 40.	40 to 45.	45 to 50.	50 to 55.	
Males,—Per cent	100	10	7	15	21	16	11	12	2	4	1	81
Females,—Per cent	100	31	19	19	16	6	3	0	0	6	0	32

From the above table it will be seen that 21 per cent of all deaths among males occurred between the twentieth and the twenty-fifth day of the sickness, while of all females who died 31 per cent died before the tenth day of sickness. The average duration of the fatal cases was: males 24 days, females 16 days.

TABLE 3.—*Exhibiting, by Sex of Patients, by per cent of cases which recovered in specified periods of time, the average duration (in days) of non-fatal cases of sickness from Typhoid Fever, in Michigan, during the year 1887. Compiled from those reports which stated the length of time the patient was sick.*

Non-fatal Typhoid Fever.	Duration of Sickness,—in Periods of Days.												Number of cases included in this table.
	All Periods.	10 to 15.	15 to 20.	20 to 25.	25 to 30.	30 to 35.	35 to 40.	40 to 45.	45 to 50.	50 to 55.	55 t 60.	Over 60.	
Males,—Per cent	100	5	6	12	16	18	15	9	6	3	3	5	203
Females,—Per cent	100	9	9	19	12	17	11	6	4	3	3	6	158

From the above table it will be seen that among males who recovered the greatest per cent of cases in any one period was in that of thirty to thirty-five days, whereas among females the largest per cent of cases was in the period of 20 to 25 days. The greatest proportions, of both sexes, were sick from 20 to 40 days. The average duration was as follows: Males 34 days, females 32 days.

The average duration of all cases, fatal and non-fatal, was: males 29 days, females 24 days, and for all cases, of both sexes, 26.5.

TIME OF YEAR WHEN TYPHOID FEVER WAS MOST PREVALENT.

TABLE 3½.—*Exhibiting, relative to the 289 outbreaks of Typhoid Fever reported in Michigan in 1887, the per cent which began in each month; also the same for the 253 outbreaks reported for the year 1886.*

Outbreaks of Typhoid Fever.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
In 1886, 253; by months, per cent	6	4	4	2	2	4	11	15	26	11	11	5
In 1887, 289: by months, per cent	5	2	2	3	6	4	12	23	20	11	9	3

From the above table it will be seen that a greater per cent of outbreaks in 1887 began during the month of August than in any other month, although there were nearly as many in September, while in 1886 the largest per cent began in September, and next largest in August.

TABLE 4.—*Exhibiting the number of outbreaks of Typhoid Fever which began, and the number which ended in each month, of the year 1887. Compiled from outbreak reports, final reports, and annual reports of health officers and clerks of local boards of health, and including the 289 outbreaks concerning which the dates of beginning and ending were stated.*

Outbreaks.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Began	14	7	6	8	18	12	34	66	57	32	26	9
Ended	10	9	3	4	13	4	12	37	48	51	45	53

TABLE 5.—*Exhibiting the number of reported cases of and deaths from Typhoid Fever in Michigan, by months, during the year 1887, under the immediate notice of the physicians who reported them, and the per cent of cases and of deaths in each month, to the total cases and deaths reported during the year.*

Typhoid Fever.	Year 1887.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Number of cases	1,096	21	14	7	8	26	35	86	223	260	204	133	79
Per cent of cases	100	2	1	1	1	2	3	8	20	24	19	12	7
Number of deaths	214	2	2	3	3	9	6	15	46	48	38	27	15
Per cent of deaths	100	1	1	1	1	4	3	7	21	22	18	13	7

From the above table it will be seen that the greatest number of cases and deaths from typhoid fever in 1887 occurred in the autumn months, the very greatest in the month of September.

TABLE 6.—*Exhibiting by sex of patient, the age at which sickness from Typhoid Fever occurred in Michigan, during the year 1887. Compiled from reports of those cases (316 males and 245 females) for which the age was stated, and which came under the immediate notice of the physicians who reported them.*

Sickness from Typhoid Fever.	Age,—in Periods of Years.											Average age.—Years.
	All Ages.	Under 10 Years.	10 to 15.	15 to 20.	20 to 25.	25 to 30.	30 to 35.	35 to 40.	40 to 45.	45 to 50.	50 Years and Over.	
Males,—Per cent	100	10	10	14	20	17	9	8	4	2	4	24
Females,—Per cent	100	17	10	20	15	10	10	5	4	3	5	22

It should be understood by every one who studies this table, that by itself alone it is not intended to supply an indication of the period of age at which there is most danger of contracting typhoid fever; although the table is useful for that purpose if one also takes into consideration the per cent of the inhabitants of Michigan at each of the several periods of age. An annual census of the inhabitants of Michigan, if properly compiled, would enable us to complete this line of evidence; but that is not yet available. From this table, it may be noticed that the average age of those reported as having had typhoid fever in 1887, was, stated in whole numbers:—males 24 years, females 22 years. This was very nearly the same as the average age of all inhabitants of Michigan, June 1, 1870, which was:—males 24.91; females 23.68 years.*

MEASURES TAKEN TO RESTRICT TYPHOID FEVER, AND SUCCESS OF SUCH EFFORTS.

Fred Grover, M. D., health officer of Hamtramck township, writes concerning one patient sick with typhoid fever, that she was kept isolated from all except three persons. The bedding was disinfected in the room, "exposed so as to allow the fumes of the sulphur to come in easy contact with all parts. All clothing changed while sick placed in boiling water immediately. Discharges were put in vessels containing a solution of sulphate of iron and buried at once." "She had a room opening into a hall which had an outside door, and no door opening from her room to other parts of the house." "The evidence of the success attending these efforts was that only one case occurred."

Dr. F. Blagborne, health officer of Marine City, writes concerning an outbreak of one fatal case of typhoid fever:

> "Excretions from bowels and kidneys have been carefully disinfected with copperas solution and buried a long distance from the well. The room and house in which patient died has been disinfected." The success attending the efforts is pronounced "satisfactory."

Dr. O. M. Stephenson, health officer of Fort Gratiot township, writes concerning an outbreak which was confined to one case, that the patient was kept isolated, the room was disinfected, the clothing was washed in zinc solution, the contents of the privy were disinfected with ten pounds of chloride of lime, and the water was boiled before using.

Other reports were received as follows: "Disinfection and isolation"; "chloride of lime for privy, sulphur for rooms"; "chloride of lime for rooms, discharges buried"; "followed instructions of the State Board of Health"; "discharges disinfected, patients isolated." "For the contents of the privy chloride of lime was used in abundance, patients were confined to their rooms (2 rooms) and as much as possible under the circumstances visitors were kept from them. The evidences of success attending the efforts at restriction were reasonably favorable." "No persons allowed in the house but the family and no person allowed in the rooms but the nurse and doctor. The fatal case was not contracted in this State; the man came down from Ashland, Wisconsin, and was sick when he left there—in fact he came down to die in Ontonagon, he having relations living here." "It was only necessary to announce the nature of the case to insure isolation, as no one could be induced to go near"; "no particular pains taken"; "neglected."

---

* Vital Statistics of Michigan, 1872, page 395.

Aug. 3, 1887, a letter was received stating that although physicians in the locality had been previously notified to report typhoid fever, they did not do so, and asking what was the "remedy in such cases." In reply a letter was sent stating that "the first duty of the health officer, on hearing of a case of typhoid fever, is to investigate it, and, if satisfied that it is typhoid fever, to apply preventive measures. The law does not require the health officer to wait for a report from anyone before he takes measures to guard the public from danger; but the law does expect him to act promptly whenever he has reason to suppose that there is a case of any dangerous communicable disease in his jurisdiction." The letter also stated that if it was a case of "typhoid fever or any other dangerous communicable disease, the attending physician is clearly guilty of a violation of the law. When a violation of that kind occurs in a village it is the duty of the village health officer to report it to the prosecuting attorney of the county."

BOIL THE DRINKING-WATER.

Typhoid fever is frequently communicated through the contamination of the water-supply by the discharges from a typhoid patient; disinfection of these discharges and boiling the drinking water will destroy the germs. There are about one thousand deaths from typhoid fever in Michigan each year, most of them of persons in the prime of life, and many, perhaps every one, of these deaths might be prevented if people would everywhere disinfect all such discharges, and boil the water they drink.

MEASLES IN MICHIGAN DURING THE YEAR ENDING DECEMBER 31, 1887.

For the year ending December 31, 1887, there were reported to the office of the State Board of Health, by all the reports received from health officers, clerks of townships and others (excepting the weekly report cards) 5,981 cases of sickness and 104 deaths from measles, in 243 localities. This is an average of about 21 cases[*] to each locality, and of one death to about 58 cases, the per cent of deaths to cases being 1.7.[†] During the year 1886, there were reported by the same sources 2,192 cases and 29 deaths in 91 localities: —an average of about 24 cases to a locality and of one death to about 76 cases, a death-rate of 1.3 per cent. In the year 1885, there were reported only 673 cases and 23 deaths in 70 localities:—an average of only ten cases to each locality, but of one death to about 37‡ cases, a death-rate of 3.4 per cent. In the year 1884, there were reported 2,178 cases and 33 deaths in 131 localities: —an average of 15 cases to a locality and of one death to about 66 cases, a death-rate of 1.5 per cent.

---

[*] Eight hundred and fifty-two cases at Grand Rapids are left out in making this average as it is a large place and always has a large number of cases.

[†] The seeming discrepancy which appears on comparison of this death-rate with the death-rate in the latter part of this article, page 270, arises from the fact that this death-rate is the per cent. of *all* deaths reported to *all* cases reported, while that in the latter part of the article is the per cent. of deaths to cases in those cases *only*, for which there were complete returns as to age and recovery or death, during the year 1887.

It will be seen that the years 1884 and 1886, exhibit about the same number of cases and deaths, but that in the year 1884, there were fewer cases to each locality and a little higher death-rate. The year 1885 is somewhat remarkable from the small number of cases, the small number of cases to a locality, and a greatly increased death-rate. The year 1887, exhibits nearly three times as many cases as any previous year for which complete reports of cases are available, about the same number of cases to a locality, but a little higher death-rate. This greatly increased number of reported cases is due, in part, to the greater care exercised by the health officers and clerks of townships in making their final reports. Measles is not yet generally regarded as a disease which should be reported and restricted under the law relative to "diseases dangerous to the public health." On this account the reports have not been as complete for this disease as they should have been. The increase of reported cases of measles in the year 1887, is also due to another cause.

PERIODICITY IN THE PREVALENCE OF MEASLES.

By reference to the accompanying table exhibiting "Measles in Michigan in each year 1877–1887," on page 265, and the diagram illustrating the curves of the rise and fall of measles by years, 1877–1887, as indicated by the "per cent of reports," "av. per cent of observers," "av. order of prevalence" and "deaths from measles" on page 266 a very marked periodicity will be observed, the times of least prevalence being seven years apart. There is not sufficient evidence to show whether the times of greatest prevalence are also seven years apart. The statements of the deaths are taken from the vital statistics of Michigan, and the other data from the weekly-report cards received at the office of the State Board of Health, and there is great uniformity in the evidence. On referring to the diagram, it will be seen, by beginning with the year 1877, that there is a decrease in the prevalence of measles in the year 1878, when it reaches a first minimum, then the rapid rise to the year 1881, when it reaches a first maximum which is followed by a slight decrease in the following year (1882) and a secondary maximum in 1883. There is then a rapid decrease to the year 1885 when a second minimum is reached, then an increase in the year 1887.

---

‡ Five deaths at Detroit were left out in making this average, as no cases were reported from there.

TABLE 1.—*Measles in Michigan for each year, 1877-1887, Exhibiting the Per Cent of Reports, Average Per Cent of Observers per Month, Average Order of Prevalence, and Deaths from Measles; Deaths taken from the Vital Statistics of Michigan; also the Meteorological Conditions in the same years at stations in Michigan.*

	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	Av. 10 yrs., 1877-86
Per Cent of Reports	7	5	12	19	26	11	24	10	5	6	14	13
Av. Per Cent (per mo.) of Observers	12	7	18	30	37	20	37	17	9	10	22	20
Av. Order of Prevalence	5.0	5.3	4.7	4.8	4.4	4.9	3.7	5.2	6.4	5.0	3.6	4.9
Deaths from Measles*§	62	16	167	125	256	150	258	144	38	129	‡	12 yrs 133
Av. Daily Range, Temp. ‖	......	......	19.22	17.03	17.17	17.43	19.13	19.01	18.78	18.53	18.46	9 yrs 18.31
Av. Temperature †	48.67	49.24	46,82	46.55	47.22	47.14	43.52	44.72	42.36	44.82	44.82	46.11
Relative Humidity ¶	......	77	74	73	75	76	75	75	76	77	77	76
Absolute Humidity	3.71	3.81	3.43	3.44	3.54	3.48	3.17	3.31	3.14	3.32	3.29	3.44
Day Ozone	2.21	3.37	2.85	3.25	3.68	3.41	3.19	2.75	2.92	2.99	3.20	3.06
Night Ozone	2.31	3.43	2.94	3.13	3.51	3.50	3.47	3.11	3.47	3.46	3.42	3.23
Av. Velocity of Wind ††	......	......	......	......	......	9.6	9.9	9.3	9.4	9.2	9.6	6 yrs 9.5
Av. Monthly Range, Bar. ††	......	......	......	......	......	.915	.922	.976	.906	.941	1.062	6 yrs .954
Av. Daily Range, Bar. ††	......	......	......	......	......	.211	.229	.206	.209	.205	.217	6 yrs .213
Av. Atmospheric Pressure	29 145	29 116	29.155	29 133	29.151	29.138	29.189	29 205	29.152	29.192	29.215	29.158

* Taken from the Vital Statistics of Michigan.
† Average of three daily observations.
‡ The deaths for 1887 are not yet compiled.
§ In 1876 there were 118 deaths, and in 1875, 134.
‖ Was not computed until 1879.
¶ Relative humidity was not computed for 1877.
†† The observations for these conditions were not computed before the year 1882.

The time between the years of least prevalence (1878–1885) is seven years, so the last maximum having occurred in 1881, we might expect a maximum prevalence in 1888, and a decrease in 1889 following the maximum, as in 1882. Whether this length of period would hold good for any preceding or succeeding period of years we cannot, at present, determine, as the statistics of sickness from this disease in Michigan are not complete for a longer time. Statistics from European *cities* indicate a periodicity of from two to four years.

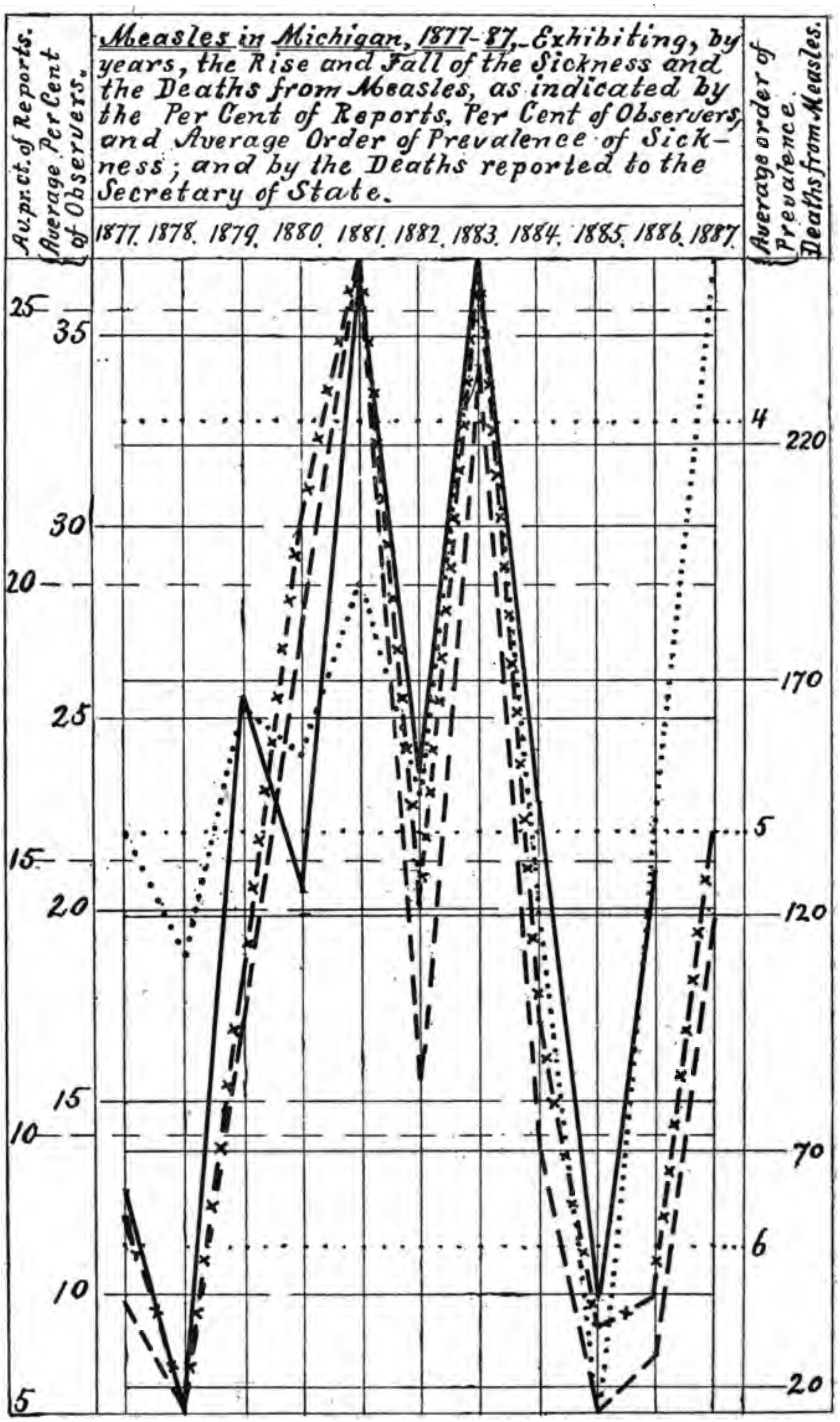
CAUSE OF PERIODICITY IN MEASLES.

Measles is one of the most uniformly contagious diseases. It attacks both young and old, none but infants in arms, especially those under six months of age, seem to have any special degree of immunity from its ravages. Even this seeming immunity of young children may arise, in great measure, from the greater care exercised in protecting them from infection. "Some few children appear, without any known cause, to be free from susceptibility for a while, but to have acquired it after a longer or shorter period."*

From the general susceptibility to the contagium of measles, among those who have never had it, and the subsequent almost total elimination of any such tendency, it is confined almost exclusively to childhood; and in countries

---

*Ziemssen's Cyclopædia of the Practice of Medicine, Vol. II., page 52.



Measles in Michigan, 1877-87,-Exhibiting, by years, the Rise and Fall of the Sickness and the Deaths from Measles, as indicated by the Per Cent of Reports, Per Cent of Observers, and Average Order of Prevalence of Sickness; and by the Deaths reported to the Secretary of State.

Deaths ————————. Per cent of Reports — — —
Per Cent of Observers —x. Av. Order of Prevalence ....

where the disease is common, very few pass through that period without having contracted the disease. When the contagium enters any locality, few of those susceptible escape, therefore "the ground is soon burned over," the disease dies out, and the community is safe until a second crop of children comes to the age of susceptibility, and there is a second introduction of the contagium. The length of time between successive epidemics is generally less in cities and large villages than in the country and in small places. In isolated places the epidemics may follow each other only after the lapse of many years. But the outbreaks in these localities are much more general, and are said to be accompanied by a much higher death-rate, probably from the greater danger to older people. With the increased facilities for travel, and the consequent intermingling of the people there is a tendency to a more uniform periodicity in both city and country, by the introduction of the contagium from the cities into the country. The length of time, then, which separates the successive epidemics, will depend upon several factors; and one would think that it should have close relation to the average age of those who have measles.

THE AVERAGE AGE OF THOSE SICK FROM MEASLES.

The average age of those sick from measles for 1075 cases in 1887 (all for which there were complete returns) was 9.7 years. This is nearly three years higher than at first thought might be considered indicated by the seven-year periodicity. But several causes probably aid in raising this average above seven years. (1) There are the isolated country places which have escaped the epidemics for several periods, and in which the average age will be correspondingly high. (2) There are those who have, by a peculiar immunity, escaped infection for many years, and at last, when far along in life, have contracted the disease. (3) There are those, though extremely rare, who have the disease a second or third time. Against these, however, must be placed those in cities where, the contagium being present in sporadic cases most of the time, the average age is somewhat under seven years. The excess of the average in the first three cases, however, is greater than the deficiency in the average in the last case; hence the average age is higher than is indicated by the length of the periods between the recurrences of epidemics.

AT WHAT TIME OF YEAR DO MOST OUTBREAKS OF MEASLES OCCUR?

Thomas says:* "Epidemics of measles can arise at any season of the year, yet statistical tables show that they occur more frequently during the cold season." This is confirmed by the reports of outbreaks during the year 1887, thus: the greatest number of outbreaks occurred during tho winter months and during the spring months. Of the 243 outbreaks reported, the number commencing during each month was as follows: January 18, February 11, March 25, April 27, May 28, June 25, July 8, August 3, September 8, October 7, November 21, December 28, and no date given 34.

MEASURES FOR RESTRICTION.

Measles is commonly regarded as a disease necessary to every individual, sooner or later in life, and from the slight regard to the danger involved in having the disease, very lax measures, if any, are attempted for its restriction. That this is the fact can be shown in no better way than by reference to the measures for restriction reported by the health officers in 1887. Of the 243 health officers and clerks of townships reporting, only 16, which is 6.6 per cent reported *any* attempt to restrict this disease. Of these 3 reported as having placarded, 3 placard and isolation, and 3 isolation alone. Others reported as follows: "Isolation as far as possible," "means have been taken to restrict it," "house quarantined," "measures will be taken," "family restricted," "proper restrictions enforced."

---

*Ziemssen's Cyclopædia of the Practice of Medicine, page 56.

To show somewhat the opinion of the board in reference to measles, and to show why more energetic measures have not been ere this advocated, the following is quoted from a paper on the Prevention of Dangerous Diseases by Hon. John Avery, M.D., President of the Board, and read at the Owosso Sanitary Convention, November 23, 1887.

> "Measles is another contagious disease of which many children die annually in Michigan, and many others made invalids through life from its effects. Under the belief that it is necessary to have this disease at some time, and that children are less liable to be severely sick with it than adults, little or no attempt is made to arrest its spread in a community, and it is allowed to take its own course. But where is the necessity for either adults or children having this disease? Children do not have it unless they are exposed to it; and there are many things a child had better catch than the measles.
>
> "Measles is neither necessary nor desirable. It brings anxiety and suffering. It means loss of time and money. It maims and kills our loved ones. Why not drive it from our midst, and save this suffering and loss of life, by keeping away from it and by keeping those who have it away from those who have not been exposed? Every case of measles comes from a preceding case. Its early symptoms are generally easily recognized. Its spread through a neighborhood is much more easily controlled than either diphtheria or scarlet fever. Its germs do not seem so tenacious of life. They are not so often carried in the clothing of protected persons, yet they may be and sometimes are so carried.
>
> "That the Michigan State Board of Health has not made such unrelenting warfare upon measles and whooping-cough as it has upon diphtheria and scarlet fever, may be explained by the adage that "when there are too many irons in the fire some are likely to burn." But it has not entirely neglected them. It has been quietly gathering statistics and storing up ammunition and arranging its batteries for an attack along the whole line."

THE CONTAGIOUS PRINCIPLE OF MEASLES.

The specific germ or poison of measles has not as yet been demonstrated. Many experiments have been made attempting to discover the specific cause of this disease, and while some have reported it as established in a very minute microbe, no experiments have been made that demonstrate that this microbe ever produces measles. It is known, however, that measles is a contagious disease, contracted from some person who is suffering from the disease, or from something infected by contact with or close proximity to such diseased person; that infection is most liable to occur by close proximity to a sick person; that an unventilated room is most favorable to contracting the contagium; although measles may be contracted even at a distance from the sick person, and in well ventilated rooms. Measles can be carried in the clothes or even by a letter, but it is not so liable to be thus carried as is the contagium of many other diseases as small-pox, scarlet fever and diphtheria.

SOURCE OF CONTAGIUM OF MEASLES.

Of the 243 reporters (health officers and clerks), 117 made no mention in their reports of the source of contagium; 32 stated that the source of contagium was unknown; 65 traced the source as from places outside of their respective jurisdictions; of these 7 reported the disease as having been contracted while traveling, on the cars 5, aboard ship 1, and while traveling 1; 12 from contagion, 6 at school, 2 epidemic, and contact 1. Several attributed the disease to various sources as: "Probably came from some other person," "Exposed at public auction," "Spread through town," "Filth," "House where had it," "Emigrants," and to "Humidity."

HOW MEASLES IS SOMETIMES SPREAD.

A letter was received under date of April 18, 1887, from A. D. Bangham, M.D., of Homer, Calhoun county, as follows:—

"Mr. Stearns, from the northern part of this State, sent his family, consisting of four little girls ranging from 8 months to 7 or 8 years of age, to this place in charge of his mother, his wife being dead. On the way they stopped seven or eight hours at a hotel in Cadillac. Just after they had paid their bill and were leaving, the proprietor remarked that his child had the measles but he guessed that there was no danger. They told him had they been informed when they came they would not have dared to stop. There wasn't any notice up, and the health officer says that he was not notified and knew nothing about it. After they arrived home, in the regular time, one child came down with the measles, and she will probably die. The father who was up north, was telegraphed for and came down. These people are very poor and it is almost impossible for them to bear the expenses incurred by this hotel keeper's carelessness or greed. It looks to me as though they could collect damages as the law was not complied with."

The following letter was sent to R. J. Cummer. M.D., health officer of the village of Cadillac:

"A case is reported from Homer, Michigan, relative to a family having measles probably contracted at a hotel in Cadillac where the family stopped seven or eight hours. As the family were leaving the hotel, the landlord told them of the measles in his house; but there was no public notice on the premises. The case was not reported to the health officer of Cadillac, so I am informed, by either physician or health officer.

"The law makes it the duty of the health officer of a city in such a case as this, to notify the prosecuting attorney of the county of the violation of the law on the part of the hotel keeper or attending physician; and the health officer has no right to disobey the law."

HOW MEASLES MAY BE RESTRICTED.

From the preceding paragraphs some very effective methods for the restriction of measles will readily be suggested.

Health officers frequently experience great difficulty in enforcing preventive measures, and letters are often received at this office asking for advice. Such is the following from the health officer of the township of Cohoctah, Wm. H. Erwin, M.D., and under date of May 30, 1887.

Sir:—We are having an epidemic of measles in this township and in school district No. 2. I am having considerable trouble in keeping the family who have the disease from sending the well member to school. I did close the school for two weeks, but the school board will not act with me, and have ordered the teacher to go on with her school. Am I to look on measles as a "disease dangerous to the public health," and if so shall I have the supervisor of this township enforce the law in this case? I believe there are some eight cases in this district.

In reply to this the following letter was sent under date of May 31, 1887:

"Except in extreme cases, I doubt the necessity of closing schools during outbreaks of contagious or communicable diseases. It is the sick and their attendants who need to be isolated, not the entire school.

"There can be no effective isolation so long as some children from families having such a disease are permitted to go to school. When one child in a family is taken down with such a disease all the others in the family should be kept at home until the danger is over.

"Measles is certainly a communicable disease dangerous to the public health, and the law makes it the duty of the health officer to look after all such diseases in his jurisdiction.

"The Board has never recommended any special measures for the restriction of measles, as it has done for small-pox, diphtheria, scarlet fever and typhoid fever, because the way does not seem quite clear to success with measles."

THE INFLUENCE OF AGE UPON MORTALITY FROM MEASLES.

To quote from Thomas: "The age of the patients is, under all conditions, of the greatest influence upon the mortality of measles. Disregarding the fact that healthy and very young children (up to about the age of six months) probably from their feebler predisposition, are attacked very mildly if at all, the rule may be laid down that measles is essentially dangerous only for young or very young children; that its danger decreases rapidly with the accession of years, and in the late years of childhood is already at a minimum; in old people who have, however, but little predisposition and are rarely attacked, the disease is again dangerous. Exceptions to this are not often reported." The accompanying table gives at a glance, the mortality at each ten-year period of age.

TABLE 2.—*Exhibiting, relative to 96 outbreaks, 927 cases of Measles, in Michigan, in 1887, the number of Cases and Deaths, and the Per Cent of Deaths to Cases in each ten-year Period of Age.*

Of All (Ninety-six) Outbreaks.	Of All Out-breaks. Total.		Reported Cases and Deaths—by Periods of Age.											
			Under 10.		10 to 20.		20 to 30.		30 to 40.		40 to 50.		50 and over.	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths	Cases.	Deaths.	Cases.	Deaths.
Total cases and deaths at each period	927	23	545	18	268	0	90	1	15	2	5	1	4	1
Per cent of deaths to cases............	2.5*		3.3		0		1.1		13.3		20		25	

* This is the per cent of the deaths to cases for all the cases for which there were *complete* returns of age and recovery or death, during the year 1887, in Michigan. The death-rate in the first page of this article is for *all* the cases and deaths reported.

From the foregoing table, it will be seen that from the age of ten to thirty years there is comparatively little danger from measles, but that after that age there is a rapid increase in the death rate; and that under ten years of age there is also an increased death rate.

The indications of this table are perhaps fallacious; because in adults the mild cases of the disease *may* not have been reported, while all the fatal cases would be more likely to be reported. Then these results are not so conclusive as they would have been, had there been more cases for which there were complete returns as to age, recovery, or death, and other definite data. The subject, however, is one of great importance; and this evidence is very gladly received and published as a valuable contribution toward the solution of an important question bearing upon public health work.

WHOOPING-COUGH IN MICHIGAN DURING THE YEAR ENDING DECEMBER 31, 1887.

During the year ending December 31, 1887, there were reported to the office of the State Board of Health by all reports received from health officers and clerks of townships, (and excepting the weekly report cards) 2,267 cases of sickness and 59 deaths from whooping-cough in 162 localities. This is an average of about 16 cases to each locality, and of one death to about 38 cases; the per cent of deaths to cases being 2.6.

As compared with diphtheria and scarlet fever the number of deaths from whooping-cough is so small, the State Board has not given it the attention that it has the more dangerous diseases. This will account in part for the incompleteness of the reports in regard to whooping-cough, compared with such other diseases. The average annual number of deaths from whooping-cough for the 12 years 1875-1886, reported to the Secretary of State and compiled and published in the vital statistics, is 148. There is reason to believe that even these are only about one-half the deaths that occurred in the State during these years; and it is quite probable that this report does not include even so large a proportion.

SOURCE OF CONTAGIUM IN WHOOPING-COUGH.

Of the 162 reporters in regard to whooping-cough, 87 made no mention of the source of contagium; 31 reported the source of contagium unknown; 17 traced the source as outside of their respective jurisdictions; 10 said "contracted at school;" 9 from "contagion." Others reported as follows: "By being exposed at meeting," "contact with other cases," "from cold," "general contagion," "from exposure," "infection," "epidemic," and "malaria."

TIME OF YEAR WHEN MOST OUTBREAKS OF WHOOPING-COUGH WERE REPORTED.

The number of outbreaks commencing during each month of the year was as follows: January 19, February 9, March 3, April 17, May 10, June 4, July 11, August 3, September 12, October 9, November 8, December 13, and no date given, 41. Thus there were 41 outbreaks during the winter months, 33 during the spring months, 29 during the autumn months, and 18 during the summer months.

MEASURES FOR RESTRICTING WHOOPING-COUGH, GENERALLY DISREGARDED.

Of the whole number of health officers reporting whooping-cough, only two reported anything done for restricting this disease. One reported "house placarded," and another reported "all children are isolated. Children from families where pertussis exists are kept out of the schools."

THE REPORTING OF WHOOPING-COUGH BY PHYSICIANS AND OTHERS.

Health officers experience great difficulty in getting reports of whooping-cough. Some physicians are loth to report cases of this disease when they meet them in their practice. Some householders, in disregard of the safety of the children of their neighbors and friends, refuse to report, and blame their physician for reporting this disease, because they dislike to undergo the inconvenience incurred by isolation and other preventive measures. This may account in part for the laxity of physicians in reporting to the health officer. Letters are frequently received asking if cases of whooping-cough are to be reported as are other contagious diseases.

HOUSEHOLDERS AND PHYSICIANS MUST REPORT EVERY CASE OF WHOOPING-COUGH.

August 1, 1887, a letter was received from G. W. Topping, M. D., health officer of the township of DeWitt, Clinton county, Michigan, as follows:

"Dear Sir:—I enclose herewith a letter from our prosecuting attorney which gives his version of our statutes in reference to reporting contagious diseases to local health officers. It is in reply to mine to him, dated July 25, giving notice that Dr. R. S. and others had not reported cases of whooping-cough in his own family, or other contagious diseases in other families. A case was mentioned where Estella Ware died of what Dr. S. called typhoid fever, and which he never reported, also his own two boys having recently had whooping-cough and communicating it to others and, in fact, introducing an epidemic of that disease here and not having reported it to the health officer. Also his student, Mr. A. K., having a small boy who is now running about our streets with whooping-cough, and not reporting it, though I had given him a blank and pointed to the terms printed on its back and asked him to report. I am told that said K. has advised others not to report, and said he should not and that he could not be compelled to report. Four cases of whooping-cough have now been reported to me since July 14, 1887, and in each of the cases I have put up a notice upon their residences and placed them under sufficient restrictions to prevent the spread of the disease. I think that a larger number have had the disease recently and have not reported it. It is now more than four years since Dr. S. has reported any contagious disease to me or to any member of the board of health of this township. During this time I have heard from others of his having many cases of contagious disease. Prior to reporting to the Prosecuting Attorney, I had made both verbal and written reports of instances of neglect to report contagious diseases to our Supervisor and they have paid no attention to the matter, so far as I am aware.

"If our Prosecuting Attorney's ruling that the law only applies to 'diseases generally fatal' be correct then there is an end of reporting any cases of contagious diseases whatever, for none are 'generally fatal.'

"I wish you would get the opinion of Attorney General M. Taggart upon these statutes, and communicate it to me. Please return the letter from Prosecuting Attorney Merrill to me after making such use of it as the circumstances suggest. Until some legal action is had I shall get no reports from Dr. S., or any whom he can influence. Shall be glad of any suggestions you may see fit to make."

The following letter was sent to Attorney General, Hon. Moses Taggart, under date of August 1, 1887:

Dear Sir,—Under Sec. 1676, of Howell's Annotated Statutes, physicians are required to report cases of "small-pox, diphtheria, scarlet fever, *or any other disease dangerous to the public health.*" The question has arisen whether whooping-cough is included by this provision. The State Board of Health has for a long time taken it for granted, and has so instructed physicians and local boards of health. In 1885, 2,686 cases of whooping-cough were reported by physicians in Michigan to local boards of health, and by the local boards to this Board. Nearly as many were reported in 1886. A certain physician, however, refusing or neglecting to report his cases of whooping-cough, was reported by the health officer to the prosecuting attorney for violation of this section, 1676. The prosecuting attorney declined to take hold of the case, declaring that while whooping-cough is a contagious disease, it "is not dangerous, and if not dangerous, then is not included in Secs. 1675-6, Howell."

I think the prosecuting attorney is in error in his ruling. Says Wm. Squire, M. D., of the London Epidemiological Society (Quain's Dict. of Medicine, p. 1771.), of whooping-cough: "It is one of three diseases most fatal to young infants." * * * "Whooping-cough comes next to scarlet fever in the number of deaths attributed to it in this country." (England.)

The view of Dr. Squire is undoubtedly correct that whooping-cough is especially dangerous to children under two years of age. It is probably more dangerous to them than small-pox is in Michigan, where vaccination is quite commonly practiced. Certainly whooping-cough causes much greater mortality in Michigan every year than small-pox does; thus, according to reports to the office of the Secretary of State for the ten years ending with 1882, the average number of deaths per year from small-pox was 53: from whooping-cough it was 156, nearly three times as many as from small-pox.

I would be glad to know if you think whooping-cough is included under Secs. 1675-76 of Howell. I wish to publish your opinion, whichever way it is.

Very respectfully,
HENRY B. BAKER,
Secretary.

In answer to the above Attorney General Taggart gave the following opinion in regard to the reporting of whooping-cough. A copy of this decision was sent to Dr. Topping, and used by him. This *copy* is clipped from the Clinton *Independent* of Sept. 1, 1887, where Dr. Topping had it published, but it has been carefully compared with the original in this office.

(Dictated.)

GRAND RAPIDS, MICH., August 16, 1887.

Dr. Henry B. Baker, Clerk of Michigan State Board of Health, Lansing, Mich.:

DEAR SIR:—Your letter of August 1st instant was received during my absence. You call my attention to *sections 1675 and 1676 of Howell's Statutes* requiring physicians to report cases of small-pox, diphtheria, scarlet fever and any "*other diseases* dangerous to the public health," and ask whether whooping-cough is included in this provision.

These sections were amended by Act No. 11 of the laws of 1883, the reading of which in this particular was not changed.

You state that the question has arisen whether whooping-cough is included in this provision. This would seem to be a question for a medical practitioner rather than a lawyer.

There can be no question that any disease which is liable to produce death is one dangerous to the public health. You call my attention to the report of Dr. William Squires of the London Epidemiological Society, who says of whooping-cough, "it is one of three diseases most fatal to young infants," * * * "whooping-cough comes next to scarlet fever in the number of deaths attributed to it in this country." (England.)

You call my attention to the fact that the reports to the office of the Secretary of State of Michigan for the ten years ending with 1882 show the average deaths from small-pox each year to be 53 and from whooping-cough 156, about three times as many as from small-pox.

From these statements and references, as well as that which is common knowledge to everybody that whooping-cough is often the cause of death among infants, there would seem to be no question but that it is included in the language of the act referred to, and that it is made the duty of physicians attending cases of whooping-cough to report the same to the health officer or clerk of the board of health, as the law provides.

Very respectfully,
MOSES TAGGART,
Attorney General.

The foregoing is a true copy.
Attest:
HENRY B. BAKER,
Secretary State Board of Health.

SMALL-POX IN MICHIGAN DURING THE YEAR ENDING DECEMBER 31, 1887.

During the year ending Dec. 31, 1887, Michigan was comparatively free from small-pox, only four cases (no deaths) in two localities having been reported to this office.

SMALL-POX IN DETROIT.

Three outbreaks, of one case each, occurred in the city of Detroit; the first case occurring on June 7. The details were not reported by the health officer. Concerning this case the Detroit *Evening News*, June 8, says:—

> About a week ago two sisters named Hurley arrived in Detroit direct from Ireland and were received at the house of Daniel Fitzpatrick, 340 Abbott street. Yesterday the younger one of the sisters, Annie Hurley, aged 19 years, was taken sick. Dr. R. Henderson was called, and at once diagnosed the case as small-pox. He consulted with Health Officer Duffield, who visited the case and agreed in the diagnosis. The health officer immediately took every precaution to isolate the case, and had the patient removed to the city pest house, where she is being attended by two sisters of charity from St. Mary's hospital.
>
> The neighborhood on Abbott street was greatly excited yesterday afternoon and stories were rife that as many as 14 immigrants had come over together and were living in Fitzpatrick's barn. The street rumor had them all down with the dreadful contagion. Dr. Duffield has carefully investigated the report and finds it to be incorrect. The two sisters came over alone and the younger one, he thinks, contracted the disease on the steamship Republic, in which she was a steerage passenger.

The second case occurred during the week ending September 17, and recovered about Oct. 8. The third case came down on Oct. 10. Of these two cases the Detroit *Evening News*, Oct. 11, says:—

> Health Officer Duffield reports another case of small-pox. This time it is Augusta Jatski, a German girl 17 years old, who was taken down yesterday and removed to the city pest house. The victim was a servant in an aristocratic Detroit family, and the health officer refuses to give either the locality or name of the family. It was only on Saturday last that Mrs. Mary Pinger, the other small-pox patient, was declared perfectly cured and allowed to go home.

VARIOLOID IN VERMONTVILLE.

A case of varioloid occurred in the village of Vermontville, Eaton county, April 14. "He was promptly quarantined and a general vaccination ordered." Of this case Dr. Wm. Parmenter, health officer of the village, writes on April 30:—

> "W. D. Collins came with wife from Kalamazoo, on the 18th inst., arriving at night. Next day he was on the street a few hours, but went to his temporary home as soon as advised to do so by myself. He was out again for an hour on Wednesday, pending the diagnosis. The eruption appeared on the 13th or 14th inst. at Kalamazoo, as a vesicular one, but was pustular when I saw him on Tuesday, 19th inst.
>
> "Diagnosis being doubtful Dr. Charles Shepard, of Grand Rapids, came by request, and gave also a doubtful diagnosis, yet thought it probably modified small-pox. He was quarantined, and still is. No new cases have occurred. Three days more will probably determine whether we are to have any new cases. Letters from Kalamazoo, by Drs. Hitchcock and Health Officer Dr. Taylor, say there is no known case of small-pox in their village. The history of probable contagium is against the small-pox theory, the eruption was almost pathognomonic. The man is well, the scabs have fallen, and he will be released *without disinfection* on Tuesday next, if no new cases appear before that time. This is the order of the local board."

The following reply was sent:

> *Wm. Parmenter, M. D., Health Officer of the Village of Vermontville, Michigan:*
>
> DEAR SIR,—Please accept thanks for your report of outbreak of supposed small-pox, also for your weekly report for week ending April 30, and your letter. In my judgment it would not be judicious to liberate the patient, and not go through disinfection, at the time the local board of health propose. Good authority places the period of incubation as not unfrequently 16 days, and sometimes 21 days. The disease is not usually communicable in its early stages. I presume this case (if it is varioloid) became communicable about the time you saw it: Tuesday, the 19th, counting 16 days from then would make May 5, as the earliest date the patient should be liberated without thorough disinfection of everything liable to be infected in case the disease is small-pox; and it seems to me thorough disinfection ought to be done anyway. The public should be given the benefit of the doubt in any case which has many of the characters of a dangerous disease.
>
> Very respectfully,
>
> HENRY B. BAKER,
>
> *Secretary.*

No other case occurred in this outbreak.

SUPPOSED SMALL-POX AT SAND BEACH.

June 3, an outbreak of small-pox was reported from Sand Beach, Huron county, the patient having arrived on the train from Saginaw City the evening previous. Upon inquiry by telegraph it was found that the patient had previously stopped four weeks at the Rupp House in Saginaw City, and one week at the Connery House in East Saginaw.

The following letter was immediately sent to Dr. Duncan, health officer of the city of East Saginaw, and one of like import to Dr. Barber, health officer of Saginaw City:—

> A case of small-pox is reported from Sand Beach, Huron county. It is a young man, named R. Davidson, who went on June 2 from East Saginaw to Sand Beach. Before going to Sand Beach he stopped one week at the Connery House in East Saginaw, or four weeks at the Rupp House in Saginaw City. I am not certain which house he was stopping in just before going to Sand Beach; but each one should be looked after. If you and the health officer of Saginaw, Dr. Barber, could unite in a little investigation, it might lead to the discovery of the source of contagium, and aid you in determining what was best to be done to prevent the disease spreading. His room, bedding, and everything he probably handled should be disinfected with fumes of burning sulphur, and every one who may have been exposed should be vaccinated at once. I would be glad to hear from you about it, and to learn all you discover and do.
>
> Very respectfully,
>
> HENRY B. BAKER, *Secretary.*

Dr. Barber wrote that the contents of the room in which the patient had lodged had been destroyed by fire, and the room thoroughly fumigated with burning sulphur, and that the same had been done at the Connery House.

The premises in the village of Sand Beach were placarded, and no one allowed to enter or leave the same except the attending physician. As the disease progressed it became evident to Dr. Hitchcock, health officer of the village, that there had been a mistake in the diagnosis of the case, but to be on the safe side he had all of the inmates of the house vaccinated, and the rooms thoroughly fumigated.

No other case occurred.

SMALL-POX IN MICHIGAN IN 1887 COMPARED WITH PRECEDING YEARS.

The following table exhibits the number of reported cases and deaths, etc., from small-pox in the State of Michigan for the six years ending with 1887:

TABLE.—*Exhibiting for each of the six years, 1882–7, the number of reported Localities, Outbreaks, Cases, Deaths, Cases per Locality, Cases per Outbreak, and per cent. of Deaths to Cases of Small-pox in Michigan. Compiled in the office of the Secretary of the State Board of Health, from reports made by local health officers.*

Years.	Localities.	Outbreaks.	Cases.	Deaths.	Cases per Locality.	Cases per Outbreak.	Per cent. of Deaths to Cases.
1882	61	?	589	159	9.7	?	27
1883	8	?	29	2	3.6	?	7
1884	5	4	22	3	4.4	5.5	14
1885	9	9	27	6	3.	3.	22
1886	4	4	*24	7	6.	6.	29
1887	2	4	†4	0	2.	1.	0

? Includes.
* Two cases varioloid.
† One case varioloid.

SMALL-POX IN OTHER STATES.

During the year there were reported to this Board from other State Boards of Health, two cases of small-pox, and three cases of varioloid, as follows:—

From Maine, one case, June 30.

Illinois, one case, December 26.

Wisconsin, three cases varioloid, March 16.

These cases were reported in compliance with the resolutions adopted by the International Conference of State and Provincial Boards of Health, held at Toronto, Ontario, October 6, 1886. (See page xvi. of this report.)

GLANDERS IN MICHIGAN DURING THE YEAR 1887.

For the year ending December 31, 1887, glanders was reported from six localities, and suspected glanders in two places, as follows:

Glanders in London Township, Monroe County.

May 10, glanders was reported from London township, Monroe county, by Thomas C. Howard, supervisor. It seems the horse had been sold by a man in Ypsilanti to a party in Milan, and the latter, after finding the horse worthless, tried to cancel the trade. In this he seems to have failed. He then turned the horse loose upon the public highway. Mr. Howard applied to this office for instructions. In reply the following was sent:—

"Relative to glanders, about which you telephoned me this morning, I send you a pamphlet which contains much information on the subject. Since it was printed, however, a law has been passed which creates a State Live Stock Sanitary Commission. It is Act 182, Laws of 1885; and it has been so amended by Act 47, Laws of 1887, as to give this commission jurisdiction over diseases of horses. Glanders is a disease dangerous to man as well as to animals, and therefore the local board of health would be justified in doing what by telephone I recommended you to do, to isolate the horse and to disinfect the hitching posts and stables about which the horse had been. I send you a pamphlet on scarlet fever so marked as to show you how the disinfection may be most advantageously performed.

"The president of the State Live Stock Sanitary Commission is Hon. H. H. Hinds, Stanton, Montcalm county, Michigan. I have written to him the substance of what you telephoned to me.

"I think you will do well to read sections 5 and 6 of Act 182, Laws of 1885, because they relate to duties of local health authorities. (Those sections have been so amended by the House and Senate as to change them materially, but the bill has not yet been signed by the Governor, so the law now stands as printed in the Public Acts of 1885.)

"Please write me in full, after the business is over, stating the action taken."

Glanders in Argentine Township, Genesee County.

July 12, 1887, Dr. A. R. Ingram, health officer of Argentine township, Genesee county, wrote that there had been glanders reported to him, and asked for information with regard to the powers of the local board of health in relation to the subject.

The following reply was sent:—

"In reply to your letter of July 12, relative to a case of glanders in a horse, I would say that the law makes it the duty of any one suspecting a case of glanders to report it to the State Live Stock Sanitary Commission immediately. The President of that Commission is Hon. H. H. Hinds of Stanton, Montcalm county.

"The law does not directly give the local board of health anything to do with glanders in animals, but as it is a disease very dangerous to man as well as to animals, the local board should see that the lives of the citizens are not endangered by any animal with glanders. I would, therefore, if you believe the horse has glanders, see that it is closely isolated until the State Commission takes it in charge.

"I would give Mr. Hinds all particulars possible."

Glanders in Meade Township, Huron County.

August 23, 1887, a letter was received from Ford W. Sellers, M.D., health officer of the township of Meade, Huron county, stating that:—

"There is a bad case of *glanders* in our township (Meade), and I have been ordered by the Board of Health to look after it. I believe there is no doubt of its contagiousness, but instances of contagion or infection are, I think, rare." * * * "Whatever is done in the matter must be strictly legal. Would you please advise as to the best course to pursue. An early reply will oblige."

In reply, a letter was sent from this office as follows:

"Please accept thanks for your letter of Aug. 21, reporting a case of glanders. The law now makes it the duty of any one suspecting a case of glanders in an animal to report it to the State Live Stock Commission, whose president is now H. H. Hinds of Stanton, Montcalm county, Michigan.

"In the meantime I think your board would be justified in insisting that the animal be kept isolated. I would be glad if you would inform me what Mr. Hinds does about it."

Glanders in the Village of Newberry, Luce County.

October 26, 1887, a case of glanders was reported from the village of Newberry, Luce county, by Dr. S. John Fraser, health officer of the village; and asking for instructions.

The following reply was sent:—

In reply to your card of October 23, for which please accept thanks, I send you by this mail two pamphlets issued by this Board with marked paragraphs bearing on the question you ask.

"Glanders is an exceedingly dangerous disease, communicable to man as well as to animals, and if you have a case, there is great danger that the disease will spread in your vicinity and be communicated to persons, if prompt action is not taken for its extermination.

"I also send you by this mail the report of this Board for 1879, on pages 333-334 of which I have marked regulations recommended to local boards of health. I hope to receive regular reports from you concerning success in restricting this disease. The law now requires that every case be promptly reported to the State Live Stock Commission. Hon. H. H. Hinds, Stanton, Michigan, is President."

Glanders Reported from Alcona County.

October 6, 1887, Dr. F. P. McCormick, health officer of Alcona township, Alcona county, reported two cases of glanders. It seems as if the disease had been more or less prevalent in this locality since December, 1885, as the township authorities "paid a Mr. Grulo for two horses which he killed" in that month, and in 1886 there were three more killed prior to March 9, with several more still living, but isolated.

Of the cases occurring in 1887, Dr. McCormick writes:—* * * "A man named Beebe had two horses so afflicted" (with glanders.) "I was called to see them two weeks ago, but not being an expert on such diseases I called in Mr. Deadman, V. S. of Au Sable, who pronounced them glanders, after he had them under observation a short time. One of the horses was so bad that I ordered him shot the other day, the other horse is in better shape." * * * "I have ordered him not to take his horses off the premises. He is perfectly willing to have the other horse disposed of, but is anxious to have the State pay for the horses. Is there any law by which he can collect it, if so whom shall he apply to, to get it before the notice of the State."

The following reply was sent:—

" In reply to your letter of Oct. 8, reporting glanders in horses in your township, I would say that the law now makes it the duty of any one knowing or suspecting a case of glanders to report it to the State Live Stock Commission. The president of the Commission is Hon. H. H. Hinds, Stanton, Montcalm county, Michigan. You had better place the matter before him as soon as practicable. Please accept my thanks for your letter, and assurance of my appreciation of your faithfulness in attending to the business. I presume the horse already killed had no value."

Glanders at Three Rivers, St. Joseph County.

November 5, 1887, Dr. W. M. Ikeler, health officer of the village of Three Rivers, St. Joseph county, wrote that a case of glanders had occurred in his jurisdiction, and requested the presence of the State veterinary surgeon. His letter was referred to that official, and the following was sent from this office:

"In reply to your letter of Nov. 5, I would say that the contents of your letter have been communicated to the State Veterinarian, Dr. E. A. Grange, and through him to the President of the State Live Stock Commission, Hon. H. H. Hinds of Stanton, Mich., who has taken a copy of the letter. Dr. Grange informs me that the matter will be attended to by the State Commission soon.

"By this mail I send you pamphlets in which I have marked paragraphs giving changes in the law. The law as amended requires every case to be promptly reported to the State Live Stock Commission. Please accept thanks for your letter."

Suspected Glanders in Two Places.

Suspected glanders was reported from Bloomfield township, Huron county, and from near Sheridan, Montcalm county.

No information relative to glanders in Michigan in 1887 has been received from the State Live Stock Commission. It is probable that such information will be found in the report of that Commission.

Respectfully submitted,

HENRY B. BAKER, *Secretary.*

HYDROPHOBIA IN MICHIGAN DURING THE YEAR 1887.

So far as could be learned but one case that can be called genuine hydrophobia or rabies occurred in Michigan during the year 1887. This case occurred in Detroit on April 28.

The patient was Henry Younglove, a farmer 60 years of age, who had removed to the city the October previous. He had been bitten by a five months' old rat terrier two months previous to his being attacked by the disease. He died at 10.30 P.M., April 28. A full account of this case is given in the Detroit *Evening Journal* of April 29, 1887.

A Supposed Rabid Dog at Flint.

About the tenth of April the Detroit *Evening News* contained the following item:—

> "The recent hydrophobia epidemic in Flint has spread to the country, and several cattle have died from the dreadful disease."

On April 11 a letter was sent from this office to Dr. Millard of the city of Flint asking for information in regard to the same. He replied in substance that several weeks previous a dog running on the streets had been shot which was said to have had hydrophobia. Dr. Millard was unable to learn that the dog had had any of the symptoms of rabies. No cases of genuine hydrophobia have been reported from that section.

A Doubtful Case of Hydrophobia at Homer.

The newspapers reported a case at Homer village, Calhoun county. A letter of inquiry was sent to the health officer, Dr. G. A. Haynes, dated December 23. The doctor replied in substance as follows:—that the patient was at times semi-delirious, when free from spasms could answer questions intelligently, some of the time she could take water, at other times it would throw her into spasms, her temperature varied but slightly from normal, symptoms were the barking like a dog, etc.

Dr. Haynes sends an extract from a Homer newspaper which he says is a correct report "so far as it goes" of the case. This paper states that the patient sick with hydrophobia was bitten about ten years before in the calf of the leg by a dog. For the first eight years she experienced no effects other than occasional attacks of pain in the limb in the region of the bite. Two years ago the first hydrophobic symptoms presented themselves in the shape of spasms, which lasted a few days only and were not severe, after which time no trouble, except the occasional pain in the limb, until Sunday evening the 18th of the present month when she was taken with an excruciating pain in the limb, which was soon followed with laryngal spasm. As the spasms were passing off, the patient would bark like a dog, snap at and endeavor to bite anybody and anything within reach. The attacks came on frequently for three or four days, when the patient recovered.

Other Outbreaks of which Little was Learned.

On May 18, 1887, a letter was sent from this office to the health officer of Hartland, calling his attention to a newspaper item concerning a mad dog in the vicinity of Hartland, alleged to have bitten dogs and sheep. Nothing further was learned concerning the case.

"Mrs. Wm. Triplett, of Colfax, Wexford county, is said to be suffering from hydrophobia."—*Detroit Evening News, April 5, 1887.*

A letter with reference to the above item was sent to Ezra Harper, health officer of Colfax township, who replied that he had removed from the township and could give no information in regard to the report, and further effort to verify the report proved fruitless.

There were also newspaper accounts concerning a supposed mad "spitz" dog in Detroit in May, 1887, also in Jackson during the same month. A fatal case of hydrophobia in man was reported at Brighton in Feb., 1887. Nothing further was learned concerning these cases.

LUMP-JAW (ACTINOMYCOSIS) IN CATTLE, IN MICHIGAN IN 1887.

This disease in the lower animals is communicable to man, and is called Actinomycosis. The following taken from "The Practitioner," volume 32, pages 289-290, defines the disease.

"The fungus-like parasite *Actinomyces*, which gives rise to this disease, has been demonstrated both in man and the lower animals. Its manifestations are characteristically seen in certain giant-celled tumors not uncommon on the jaws of oxen, and in ulcerated nodules or tubercles which occur in the mucous membrane of the mouth and nose in these animals." * * * "The bovine tumors present on section a translucent, greyish-yellow lardaceous aspect, with here and there centres of suppuration, and are dotted with yellowish spots the size of a pin's head, which are the points of development of the fungus."

The sale of meat from lump-jawed cattle was reported to this office from but one locality in the State during the year 1887, as follows:—

The Detroit *Evening News* of December 17, 1887, contained a statement that "lump-jawed cattle are being butchered in Detroit and sold to unsuspecting purchasers."

The following communication was sent to the city health officer, Dr. S. P. Duffield, Detroit:—

"The Detroit *Evening News* of Dec. 17, 1887, states that 'lump-jawed cattle are being butchered in Detroit and sold to unsuspecting purchasers.' I presume that the disease referred to is actinomycosis, which is communicable to man as well as to animals. Although it may not be of much danger, it is well to keep watch of such occurrences. If you learn anything concerning the matter, will you have the kindness to report to this office, so that I can make use of, the information for the benefit of the people of the State."

In reply, the following letter was received from Dr. Duffield, Dec. 23.

"In answer to your letter, I would say George Kunzler, Esq., meat inspector, says he found four sold here in Detroit, and one carcass and two hides to Mt. Clemens, and refuses to say where they were sold, but will put the Sanitary Live Stock Commission on the track should they desire to follow the matter up.

"This is a case which should be followed up. Our State laws on this subject should be prosecuted and that with vigor. The meat inspectors say they are powerless under the ordinance of the city of Detroit to act and refer it to the Sanitary Live Stock Commission.

"You had better see whether the Live Stock Commission intend to wake up to this subject."

The following letter was then sent to Hon. H. H. Hinds, President of he Live Stock Sanitary Commission:—

"George Kunzler, Meat Inspector of Detroit, says that he has found four lump-jawed cattle so in Detroit, and one carcass and two hides sent to Mt. Clemens. He says that under the ordinance of the city of Detroit he is powerless to act, but if the Live Stock Commission desires to follow the matter up, he will put them on the track. I have communicated with the health officer, and he thinks that he has no power to act in the case.

"This is a disease communicable to man as well as to animals, and I would be glad if it could be investigated even at this late day. The name of the disease is 'actinomycosis.'"

The following reply from Hon. H. H. Hinds was received :—

"Replying to yours of yesterday relating to sale of lump-jawed cattle in Detroit, permit me to say that I have understood from veterinarians that this disease was not contagious to any greater extent than tuberculosis. That it was a scarbutic disease and probably hereditary.

"The law under which this commission is acting does not contemplate that the commission shall say what meat is wholesome for man to eat nor what should be condemned. The health authorities are charged with that duty. A copy of your communication will be submitted to my associates immediately. The State Veterinarian is out of the State for a short holiday."

Upon communicating the substance of the above letter to Dr. Duffield, he replied by letter, dated Dec. 28, 1887, as follows:—

"Your letter is before me. In the city charter, page 82, sec. 48, it reads as follows:—'The said council shall have power to prohibit, prevent, and suppress the sale of every kind of unsound, nauseous, and unwholesome meat, poultry, fish, vegetables, etc., etc.' Now under this charter an ordinance was framed which reads as follows: Chap. 66, Sec. 18. 'No butcher, forestaller, grocer, trader, or other person shall sell, expose, or offer for sale in any public market or any place within the limits of the city of Detroit any unsound, diseased, stale, rotten, fermented, nauseous, or unwholesome meat, poultry, fish, etc. * * * or the flesh of any animal dying otherwise than by slaughter.' Also an ordinance for private meat markets, page 160, chap. 67 ordinance for city of Detroit for 1884. 'No person licensed under this ordinance shall sell or expose for sale any unwholesome, emaciated, blown, stuffed, tainted, bruised, putrid, unsound or measly meat.' The ordinance which appoints the meat inspector does not exist, nor is there any ordinance defining his power. He can simply tell them not to sell the meat, but he has no power to destroy the meat should he know it to be bad, etc. The only power he has is under the State law which you can find in Howell's Annotated Statutes.

"Now I should think that the State Sanitary Commission could follow up the lump-jawed cattle and prosecute those who sold them. If they cannot do this their power is *nil*.

"See Compiled laws of Michigan 1871 section (7726), Howell's Annotated Statutes, §9316. This is all we have, and so far it is of no avail."

SUPPOSED ANTHRAX IN KENT COUNTY, MICHIGAN, IN 1887.

This disease was reported August 16, 1887, by Dr. Lupinski, health officer of the city of Grand Rapids, as suspected of being among cattle in Paris township, several having died of the disease. August 18, Dr. Lupinski wrote: "The disease in Paris township is anthrax. I examined the spleen of an animal that died, and found the bacillus anthracis and its spores."

Malignant pustule—Anthrax is a specific contagious disease communicated to man from horned cattle, horses, and sheep, and is very often fatal.*

---

* Dictionary of Medicine, Quain. Page 1302.

"Anthrax, when occurring in man, is invariably derived from cases of splenic fever of the lower animals, either by direct or indirect contagion. The poison may enter the system either by local inoculation or inhalation of the dust containing it. * * * "All parts of the bodies of animals dying of the disease are actively poisonous, and may convey the disease by direct or mediate contagion.

"Direct inoculation is rarely, perhaps never, from the living animal, usually from the carcase affecting, therefore, chiefly butchers, slaughterers, etc.

"With regard to animals, the researches of Pasteur seem to show that the bacillus may be cultivated in the earth around buried carcases, carried to the surface by earth worms, and so distributed on vegetation."*

The suspected cases of anthrax in Kent county were reported to the State Veterinarian, but the final results of his examination, or of the disease, whatever it was, have not been reported to this office. No deaths or cases among persons were reported.

In the proceedings of the Connecticut State Medical Society, New Series, Vol. IV., No. 1, is an interesting account of a fatal case of a woman who died of malignant pustule in that State in September, 1887. The disease is of such importance that physicians should be upon guard that it may at once be recognized. Dr. E. F. Parsons, who reports the case in Connecticut, says of malignant pustule: "At its first appearance it is simply a pimple, unpretentious and apparently inoffensive. It could easily be mistaken for a flea bite. But it soon causes severe pain and an inordinate amount of swelling in the tissues adjacent. The pimple develops rapidly, and in a few hours becomes a vesicle, then a pustule with a dry crust, brown, circular, often umbilicated, with or without an areola. These appearances whenever and wherever found should startle the medical observer, who will do well not to be misled by their seemingly benign aspect."

TYPHUS FEVER AT QUINCY, HOUGHTON COUNTY, MICHIGAN IN THE YEAR 1887.

In the annual reports from the health officer and clerk of the township of Quincy, Houghton county, Michigan, there were reported seven cases of sickness and two deaths from typhus fever. As this disease is rare in this country, and from the possibility of its being reported for typhoid fever from the similarity in name (the Germans call typhoid abdominal typhus), the following letter was sent to F. J. Downer, M.D., health officer of Quincy, that further information might be obtained.

LANSING, *Michigan, Nov. 4, 1888.*

DEAR SIR:—"I notice on your annual report as health officer for 1887, a report of cases and deaths from typhus fever. Will you have the kindness to inform me whether these were simply cases of abdominal typhus (typhoid fever), or whether they were really cases of typhus. This disease is very rare in this country, and it is on this account that I write. The disease was not reported here at the time. Will you kindly inform me what measures were taken to stamp out the disease, and all the facts in your knowledge concerning its origin, etc.?"

In reply, the following letter from F. J. Downer, M.D., was received:

HANCOCK, *Michigan, Nov. 20, 1888.*

DEAR SIR:—"I am in receipt of yours of the 14th inst., in which you desire further information concerning cases of typhus fever, which were reported by me in my annual report for the year 1887, as health officer for Quincy township, Houghton county, Michigan. They were cases of genuine typhus

---

*Dictionary of Medicine, Quain. Pages 1302-1307.

and not of typhoid fever as you seem to think. The initial symptoms and lesions of the latter were absent, while those of the former were very prominent, particularly the eruption, The first case was in a man lately arrived from Finland. He died on the third day of the attack. The house was strictly quarantined, and a guard appointed. Seven in all residing in the same house were attacked, and one, a two year old child, escaped. It is supposed that the first person attacked contracted the disease on shipboard while on a voyage from Finland to this country, as the disease developed a few days after his arrival.

"After the recovery of the last case, the premises were thoroughly disinfected, and no other cases ocurred."

The township clerk, A. F. McDonald, in his annual report, states that of the seven cases, five were males aged respectively 25, 25, 24, 26 and 20 years, and two females aged 22 and 20 years. Two males aged 25 and 26 years died. Appended to this report is the following note:—

For the case recorded as number one, the disease was "contracted on shipboard by a Finland emigrant who arrived in this township a few days previous to his attack. He boarded with the family who afterwards contracted the disease. The case was ably handled by our physician, Dr. F. J. Downer, or more serious results would have ensued."

The health officer of Quincy deserves credit for his prompt action and thorough work in restricting the disease in his jurisdiction. When typhus fever is suspected the patient should be promptly isolated, and no one except the physician and nurse allowed to see him. All clothing and bedding should be thoroughly disinfected before going to the laundry or wash-room. After the patient has recovered, all clothing and bedding, the rooms where he is sick, and everything that *may be* infected should be thoroughly disinfected.

ALLEGED NUISANCES IN MICHIGAN IN 1887.

During the year 1887, communications in regard to twenty-six alleged nuisances were received at the office of the State Board of Health.

The nuisances mentioned in these communications may be classified as follows:—Dead animals, 3; slaughter-houses and hog yards, 3; manure piles, 3; hog pen at a hotel, 1; overflowed lands, 2; feeding slaughter-house refuse to hogs, 1; whey vat, 1; "fill" in Quincy channel, 1; privy vaults, 2; sawdust thrown into streams, 1; garbage dumped on swamp lands, 1; disposal of waste and rinsing water from a creamery, 1; cemeteries, 3; defective sidewalks, 1; cow-yard and hen-coops in a village, 1; garbage, 1; lowering of water in a mill dam, 1.

The State Board of Health has no legal authority to remove or abate nuisances. Its powers relative to nuisances are advisory, and accordingly action was taken by the Secretary, or by the State Board when in session, in each of the cases of nuisance in which action was requested. The following extracts from the correspondence show the nature of the complaints made, and the measures recommended by the State Board of Health, or by the Secretary.

HOW CAN A TOWNSHIP HEALTH OFFICER LEGALLY ABATE A NUISANCE?

Sept. 20, 1887, W. B. Anderson, M. D., health officer of Pine Grove township, Van Buren county, wrote:—"Last spring I, as health officer, employed a man to bury the carcase of a dead horse which was found on the lands of a non-resident of Pine Grove township. The carcase was in an advanced state of decomposition. I guaranteed the payment of three dollars to the man for burying the same. * * * * The work was done and the bill sent in to the township board. They refuse to pay the bill, saying the charges were exorbitant. * * * * Was I not right in proceeding to dispose of the pest in the way I did, without consulting the board, and if so must I submit to their refusal.

In reply to this letter the Secretary of the State Board wrote to Dr. Anderson as follows:—"Unless the local board of health has given you, as health officer, the power to secure the immediate burial of a dead animal without consulting them, I do not see how the board can be legally responsible for the claim of $3.00. * * * * The state law does not give the health officer the power to act independently of his local board in cases of dead animals unburied, or other nuisances. The local board is given the power to investigate and abate nuisances; and it can make general rules and regulations regarding nuisances, which, when published, have the force of law. I would advise you hereafter to simply call the attention of the local board to any such nuisance and wait for special or general authority to abate it.

"The local board should pay this bill. Of course the owner of the horse or the person who left the body lying in the field is liable to a fine under Sec. 7734 of Comp. Laws, Sec. 9323 of Howell's Statutes."

FEEDING HOGS ON THE FLESH OF DEAD HORSES.

It having come to the knowledge of the office of the State Board that a man in Jackson was fattening hogs on the flesh of dead horses the Secretary wrote to the health officer of that city, March 11, 1887, asking to be informed of the facts in the case, and what the local board had done or would do in regard to it.

By letter dated March 12, J. L. Mitchell, health officer of Jackson, responded to these inquiries as follows:—"About one month ago, one Fessenden was arrested on complaint of our board for leaving a dead horse on the commons. On trial before a justice he made the statement that he was trying to deliver the dead horse to one Russell, who runs a slaughter-house and keeps about a hundred and fifty hogs, to be given to the hogs for food, and that he had already delivered this year two other dead horses to the same Russell, which were for fattening hogs.

"Fessenden was fined five dollars and given ten days in jail.

"I presented the case of Mr. Russell for feeding deceased animals to his hogs and then selling them in the markets, to Mr. Bingle, our prosecuting attorney, asking that such a transaction be stopped by law, as I considered it dangerous to the public health. He informs me that no action can be maintained unless we can prove that the meat of hogs so fattened is actually detrimental to the health of the consumer. Thus the matter rests.

"I would like to ask you if this kind of business can go on unrestricted, and if there is no law that will reach it. I will be much obliged for your opinion of the case, as this is not the only instance of the kind in our city."

In reply to the foregoing letter, March 14, 1887, the Secretary wrote to Dr. Mitchell:—"I would say, that I am not in a position to contradict your prosecuting attorney's statement. It would seem, however, as though it ought to be taken for granted that the practice of feeding dead horses to hogs, designed for the market, is dangerous to public health. There must be a way to put a stop to such abominable practice. If the matter were made known, however, to the public, I should presume that Mr. Russell could not sell his hogs. Then the city board of health, under the State law, (I do not know about your city charter) has the power to make general regulations governing slaughter-houses and offensive trades. I think the board of health can legally make a rule forbidding anyone to feed dead horses to hogs, and after the rule has been published it is enforcible."

BURIAL OF DEAD ANIMALS.

A complaint was received from Sutton's Bay that the carcase of a dog was allowed to remain lying near the highway, in Bingham township, after notice thereof had been given to the township officers.

The action taken in this instance, was a letter from the Secretary to the informant, stating that the attention of the health officer of the township would be called to the nuisance, and to the duty of the local board of health, to abate it; also a letter under date of June 18, 1887, to John A. Lawrence, health officer of Bingham township, as follows:—"I am informed that a dead dog is lying near the highway somewhere in your township, and that it is offensive to passers-by and to the residents of the locality. Sec. 1640, of Howell's Annotated Statutes, makes it the duty of the local board of health to inquire into nuisances and to abate them. I hope that it will be done in this case without delay. I would be glad to hear that the dog has been buried."

SLAUGHTER-HOUSE AND HOG-YARD IN A VILLAGE.

The appended extracts from a letter (dated June 21, 1887), show the nature of the alleged nuisance in Grandville, Kent county:—

"I wish to respectfully call your attention to the condition of a certain building and lot, rented and used for the purposes of a slaughter-house and hog-yard, situated in the incorporated village of Grandville, and located only about six or ten rods from dwelling houses, occupied by some of the most respectable people of this village; the yard containing at the present time from 10 to 23 hogs, and the whole place in the filthiest condition possible. * * * * * The affair came up before the trustees last summer, in the form of a petition, was before them nearly three months and special meetings were called, but for all, the reeking filth was so powerful as to send some of the residents away from their homes until after cool weather; yet the health officer persistently kept from taking any action in the matter, and as a last resort, I, a resident, ask you respectfully, must we still be obliged to close our houses through the long summer days and nights as we did the last summer? * * * * The health officer himself said that the numerous cases of malaria in the immediate vicinity of the place last fall, were, he thought, due to the slaughter-house. * * * The man who owns it is Geo. Van Nest, and the occupant is T. Colwell. They said they cleaned it out once last summer, and the way they did it was to dig a pit and run all decayed blood into it from where it stood 18 inches deep under the floor, and then cover the pit over with loose boards."

In response, July 26, 1887, the Secretary wrote that he had sent to the informant documents issued by this Board, marked in a manner to show the proper course to take; and assuring the informant that he would write to the local health authorities and urge them to take measures to abate the nuisance; and the same date (July 26, 1887), the Secretary addressed the following letter to the President of the village of Grandville:—

"DEAR SIR:—Complaint reaches this office of an alleged nuisance in the form of 'a slaughter-house and hog-yard situated in the incorporated village of Grandville, and located only about six or ten rods from dwelling houses.' By this mail I send you documents issued by this board in which I have marked paragraphs concerning the duty of the local board of health in such cases. I hope that you will take such action as will lead to the abatement of the nuisance."

ALLEGED NUISANCE IN LINCOLN TOWNSHIP, MIDLAND COUNTY.

The alleged nuisance, reported by letter, dated June 12, 1887, consisted of a place where "butchering" had been done in a barn the previous fall, the offal thrown out and covered with manure, and where hogs are now kept. The premises thus used being in close proximity to dwelling houses, was considered a nuisance; and the writer states that the health officer and supervisor of the township had been notified of the case; but had not made any effort to abate it.

The reply given to this communication by the Secretary, per letter, dated June 14, 1887, was as follows:—

"I would say that if the nuisance you describe is on private property (as from your letter I judge it is), it is the duty of your local board of health—after finding by actual investigation that it is a nuisance—to notify the owner or occupant to remove the same at his own expense within 24 hours. If he neglects to do so, he forfeits a sum not exceeding $100. I would refer you to section 1641 of Howell's Annotated Statutes.

"I would presume that your local board of health would investigate any alleged nuisance, if one or more citizens should respectfully request it; and I would advise you to get up a petition signed by the citizens who know of the facts, and send it to the president of your local board, who is the supervisor. If convinced that it is a nuisance, the duty of the local board is as I have stated."

IS IT A PUBLIC OR A PRIVATE NUISANCE?

In a letter from Ida, Mich., Sept., 26, 1887, complaint was made in regard to a manure pile:—

"Our neighbor, Mr. John O'Farrell, has a horse stable about twelve feet from my kitchen and dining-room window, and he keeps two horses all the time, and the manure pile is about three feet from my window. * * * It is terrible to live and endure that bad smell and filth; besides, our well—and that is our drinking water—is about sixteen feet from the manure pile, and it is spoiling our well. We have all been sick more or less, and the Dr. says that the water is not fit to drink, and that it is very unhealthy to have that manure yard and stable where they are. * * * I thought that you had the power to remove it. The Board of Health here seem to pay very little attention to it, because it will have to be done by force and law. He began to pile the manure there last fall and kept piling it there until June, and we could not endure the smell any longer, and had to enter complaint three times to the Board of Health, and then by written notice he did remove it, and we find that the yard and stable are just as bad. It is so near by we are afraid it will ruin our well water. * * * Please try and see what can be done about this matter." * * *

September 29, 1887, the Secretary, in reply, wrote:—

"I would say that the law (sec. 1640 of Howell's Annotated Statutes) makes it the duty of the local board of health to 'examine into all nuisances, sources of filth, and causes of sickness that may, in their opinion, be injurious to the health of the inhabitants. * * * and the same shall destroy, remove, or prevent, as the case may require.' Following sections give further details of the law. * * * I will write to the health officer of Ida township, Dr. F. B. Jones, or to the supervisor of the township, and if they do not do their duty, write me again."

The same date (Sept. 29) the Secretary wrote to F. B. Jones, M. D., Health officer of Ida township:—

"Complaint reaches this office that Mr. John O'Farrel has a horse stable about twelve feet from the kitchen and dining-room window of Wm. Kleoppel in Ida. The manure pile is about *three* feet from the window, which causes a nuisance, and is believed by the family to be the cause of their sickness. The manure pile is within 16 feet of Mr. Kleoppel's well.

"The law (Sec, 1640 Howell's Annotated Statutes) makes it the duty of the local Board of Health to 'examine into all nuisances, sources of filth, and causes of sickness that may, in their opinion, be injurious to the health of the inhabitants within their township, * * * and the same shall destroy, remove, or prevent, as the case may require.'

"I hope that your board will investigate this as soon as possible, and act if occasion requires."

Responding to the foregoing letter, Dr. Jones, Sept. 30, writes:—

"I received your letter to-day, and will say that I looked after that nuisance and reported to one of the justices of the board, and he caused a written notice to be served; but I will call a full meeting of the board at the earliest possible moment, and then we will all inspect the premises and take action on the matter."

Another letter from the first informant was received at this office, dated Oct. 6, from which the following quotations suffice to show the tenor:—

"The Board of Health called a meeting yesterday morning, and decided that Mr. John O'Farrel should keep the manure cleaned up, and that he could leave the building where it is, and use it for a horse stable. That is all they have done about it, and I am not satisfied. * * * Dr. F. B. Jones told me this morning that he wished that you would come here, and that is what I want. * * * The Board here gave O'Farrel twenty-four hours to take away that manure, * * * but he has not done it. What he did not plow under, he has banked up the stable with. He (O'Farrel) says there is no law in America that can prevent him from doing as he is a mind to. * * * Now, please, come here and attend to this matter for us, and if the State will not pay your expenses I will, and furthermore see that you are cared for while here, if you will be so kind and come, and bring the whole board if need be." * * *

In answer to this letter the Secretary wrote, Oct. 10:—

"In reply to your letter of Oct. 6, I would say, that it is impracticable, for a number of reasons, for this board to send anyone to investigate the nuisance of which you complain.

"If your board will not abate the nuisance, you can have recourse to the courts, in a private suit, but for this, of course, you should consult a lawyer."

Oct. 17, 1887, Dr. F. B. Jones, health officer of Ida township, wrote to this office as follows:—

"I write you concerning that stable that Mrs. K. has been writing you about. The township board has met to-night, for the third time, to take action on the matter. I think that all that was written you was true in regard to the stable. This board have taken counsel on the matter, and counsel say that they don't think that the board of health have jurisdiction over the use of the building as a stable, as it is a local matter between two families, and does not affect the community at large. I think that any sensible physician would say that the use of water from a well so near a horse stable (with a natural descent of the land toward the well) must be very unhealthy, and in warm weather the urine will smell bad, I know. I will say, that I think it a local nuisance, and should be abated; and I think that Mr. Kleoppel has remedy in the Circuit Court, or Court of Chancery. The board has ordered John O'Farrel to remove all of the manure, and to throw no more out there. What more can we do? In townships where there is no incorporated village, who constitutes the executive officer? Is it the health officer or the supervisor? The township board have appointed me as their health officer, and the township board maintain that if our orders are not complied with that it becomes my duty to enter a complaint to the prosecuting attorney for prosecution. I think the supervisor the proper one. Please answer and oblige."

In reply to the foregoing letter the Secretary wrote to Dr. Jones, Oct. 17:—

"I would presume that the local Board of Health might authorize either the supervisor or the health officer to act as its executive officer in the matter of making complaint. The law says the health officer shall be an executive officer.

"It seems to me that the nuisance is a public one, because the 'public' may drink water at the residence of the family, into whose well the drainage of the barn probably goes.

"Suppose a village 'social,' to be held at that house, and twenty or thirty cases of typhoid fever to result, would not your board feel that they had neglected something of public importance?"

ALLEGED NUISANCE IN BATH, CLINTON COUNTY.

Aug. 3, 1887, a citizen of Bath, Clinton county, wrote to members of this board complaining of the existence of a manure pile, in the street, near his dwelling, which, owing to the obnoxious odors emitted therefrom, constituted a nuisance.

The action taken in regard to this alleged nuisance is shown by the following extracts from letters written by the Secretary of this board regarding it:—

Aug. 5, 1887, to the informant: "I will write to the president of your local Board of Health, Mr. Sylvanus Bachelder, relative to the nuisance of which you complain, pointing out to him the duty of local boards of health to abate nuisances. I send you by this mail two small pamphlets, with parts relative to nuisances marked, and would ask you to read them carefully, as they will give you much information on the subject."

Aug. 5, 1887, to Mr. Sylvanus Bachelder, President of Bath township Board of Health: "Dear Sir:—Complaint has reached this office that manure is thrown out from a barn on Main street in Bath village, so that it falls on the sidewalk and near the path or entrance to the house of Mr. Thomas Eastwood.

"By this mail I send you two documents from which you will learn the duties of local Boards of Health relative to nuisances. It is the duty of local boards to investigate nuisances and to order their abatement.

It is claimed that this manure pile is a serious nuisance."

Aug. 6, 1887, to Mr. Thomas Eastwood:—"* * * I might say further, however, that a manure pile is not always a nuisance; but when it is so placed and kept that it becomes offensive to a neighbor or to neighbors, it is unquestionably a nuisance, and a public nuisance, which the local Board of Health should abate. Wood, in his work on Nuisances, says: 'It may be stated, as a general proposition, that every enjoyment by one of his own property, which violates the rights of another in an essential degree, is a nuisance.' A manure pile so situated and kept as to give off odors to passers by, and possibly to contaminate a neighbor's well, is a nuisance.

"I sent you yesterday documents in which you can find the duty of the local Board of Health in regard to nuisances. * * * You had better therefore address a communication to your local board, through the supervisor, calling their attention to the manure pile which you claim is a nuisance, and ask that they investigate it.

"If the local board refuses to do anything about it, you can consult a lawyer and take legal measures in the courts."

AN ALLEGED NUISANCE AT HARRISON, CLARE COUNTY.

A letter dated June 10, 1887, from Dr. P. E. Witherspoon, Health Officer of the village of Harrison, submits the following case of alleged nuisance:—

"Mr. Campbell complains that the waste water, etc., from the Northern Hotel across Sylvanstine's lot causes bad odor, offensive, etc., to me. I notify Sylvanstine to clean up his rear lot. He says it comes from the Northern Hotel and barn, and he says he won't clean it up. I notify Mr. Heller, the Northern Hotel man, to stop creating a nuisance, and he says he won't do anything. What shall I do? *We have no system of sewerage*, and the incline of the land is toward the lake where the supply of water is from. The streets are all higher than the center of the lots in mention."

In reply to Dr. Witherspoon's letter, the Secretary wrote to him, June 15, 1887, giving all necessary information in regard to the duties of the health officer and the local Board of Health, under the circumstances; and stating that he had sent him (Dr. Witherspoon) a pamphlet on "Work of Health Officers and Local Boards of Health," which contained a discussion of the subject of nuisances, with reference to the law.

ALLEGED NUISANCE OF A HOG PEN IN MARSHALL.

David Cunningham, Justice of the Peace of Marshall, wrote May 14, 1887, as follows:—

"At the Michigan Central Depot in this city, and in close proximity to dwelling houses, a nuisance in the way of a hog pen is kept by the proprietor of the Michigan Central R. R. Hotel. In the same are kept from 24 to 60 hogs. Now, as warm weather approaches, the stench from this pen is dangerous to public health. Personally I called the attention of the local Board of Health thereto, and asked that the same be abated. I was informed by two members of this Board of Health, one of whom is the health officer, that this pen can be kept clean so as to avoid creation of unwholesome smells, and hence order the proprietor to clean out said pen and continue keeping the pen in operation. * * * * This pen is just as close to the M. C. R. R. track as can be conveniently, and is only about one *rod from* a *dwelling* house where there are several young children, and about ten rods from three other dwelling houses, and about five rods from R. R. Hotel, where passengers dine.

"Will you be kind enough to give me your ideas in relation to such a concern, and do you think that this number of hogs can be kept clean so as to render offensive smells impossible.

"This is the only pig pen in the city, and is dangerous to public health."

May 16 and June 20, 1887, the Secretary of this board wrote to Mr. Cunningham the following opinion in regard to the alleged nuisance in question:—

"I do not see how 24 to 50 hogs could be kept in the location which you describe, so near to dwelling houses, without causing a nuisance. If unusual care were taken, much of the danger of nuisance might be avoided; but probably such care would not be taken uniformly. If your local Board of Health has carefully investigated the hog pen, and has declared it to be a nuisance, I would be inclined to presume that it is a nuisance.

In a later letter, Mr. Cunningham announced that the nuisance had been abated, and requested permission to publish in the local papers the opinion given by the Secretary in regard to it. The request was complied with.

ALLEGED NUISANCE AT CHIPPEWA LAKE, MECOSTA COUNTY.

Robert Blair, clerk, and James T. Clark, M. D., Health Officer of the township, wrote, asking for information and advice as to the course their local Board of Health should pursue, in regard to an alleged nuisance said to exist under the following circumstances: There is a dam across the outlet of Chippewa Lake, which, by causing the water to rise and overflow certain low lands in the suburbs of the adjacent village, creates a stagnant pool there of about one hundred acres in extent. Numerous complaints of offensive odors and other malarial emanations emitted from this pool induced the local Board of Health to investigate the matter, and the pool or swamp was declared a nuisance by that body, and its abatement, by removal of the dam and drainage of the overflowed lands was ordered. The owners of the dam (The Chippewa Lumber Co.) refused to comply with the orders of the local Board and addressed the following letter to this office, June 20, 1887:—

"DEAR SIR:—We have received an order signed by the township clerk of this township, as clerk of the Board of Health, ordering us to remove the dam at the mouth of Chippewa Lake. The dam in question has been in for over 12 years, and this is the first complaint of same for damage to the health of the place. We came here four years ago last fall and invested about $400,000 at and near this place for manufacturing purposes, and raised the dam about two feet in order to get saw logs up to our mill slide. The place has always been very healthy, as our present doctor, Mr. Clark, who is a health officer, will testify to, and who farther says that it will be very injurious to the health of the place to have the dam removed at any time, excepting late in the fall or early in the spring. We would like to have you look the matter up thoroughly before allowing the supervisor of this town to cause us to remove said dam, and we would refer you to Drs. Griswold and Dockry, and also our Senator, Lew Palmer, and M. Brown, attorney, of Big Rapids, as to the healthfulness of the place, and for any reference you may need. Trusting you will give this matter a thorough investigation before giving the town Board of Health any instructions in regard to the matter."

The following letters from the Secretary explain the action taken in connection with the above communication:—

"*Robert C. Blair, Clerk of Chippewa Township, Chippewa Lake, Mecosta County, Mich.*:

"DEAR SIR:—In reply to your letter of June 20, relative to overflow of water caused by a dam at 'the outlet of Chippewa Lake,' I would say that the best way to proceed, if your Board of Health is convinced, after a careful investigation, that the overflow is dangerous to public health, is to enter complaint before a court, your circuit court. On general principles, I would say that in this case it will admit of sufficient delay to do this, because generally we would not advise the lowering of water in such cases during the summer season. Through such action it might be *more* dangerous still. Usually if the water over a large area is to be lowered, it should be done in the spring or fall. Of course I cannot speak emphatically in regard to this particular case, not having investigated it myself. * * *

"I send you two documents with parts bearing upon these questions marked.

"I would be glad to learn what is done about it. This Board would take pleasure in assisting your board in any way possible to promote the public health."

"*H. P. Wyman, Secretary Chippewa Lumber Company, Chippewa Lake, Mecosta Co., Mich.*:

"DEAR SIR:—In reply to your letter of June 20, relative to the dam at the 'mouth of Chippewa Lake' and the overflow which it causes, I would say that I take pleasure in sending you one of the documents issued by this Board with that part marked relative to nuisances. These documents are supplied to local boards of health.

"The local board of health is required by law to investigate nuisances, and to order their abatement; but declaring a thing to be a nuisance does not make it so if it is not so in fact, and hence a local board is cautioned not to be hasty. When property and business are involved, and especially where delay is possible, the best way for the local board to do is to carry the question to the circuit court. I would hardly suppose that your dam could be destroyed without it were proved in such a court that its existence was dangerous to the public health.

"I do not know of this case from actual observation, but on general principles I would *not* advise that the water over a large area be lowered in the summer time, much sickness *might* result. It would, I think, be safer to wait until spring or fall.

"Very respectfully,

"HENRY B. BAKER, *Secretary*."

ALLEGED NUISANCE—LOGS AND BRUSH IN A STREAM.

A letter received at this office, dated June 6, 1887, from Aral, Benzie Co., conveyed complaint that employés of the Malcolm MacDonald Lumber Co. had filled a creek near the premises of a householder with logs and brush which emitted offensive odors, regarded as very unhealthful. Application to have the nuisance abated had been made in vain to the local board of health.

The Secretary of the State Board pointed out the proper course to pursue, in regard to the nuisance as follows:

"In reply to your letter of April 6, I would say that overflowed lands are usually detrimental to public health, and from your description I should think that of which you complain is not an exception.

"I send you three papers bearing upon the question, which it would be well for you to study especially the parts I have marked.

"If your local board of health refuses to do anything about it, it might be well for you to consider section 6377 of the Compiled Laws of 1871*, which gives the circuit court equity jurisdiction in all matters concerning nuisances, where there is not a plain, adequate, and complete remedy at law, and which authorizes the circuit court to grant injunctions to stay or prevent nuisances."

ALLEGED NUISANCE—FEEDING SLAUGHTER-HOUSE REFUSE TO HOGS.

Dr. Fred. Grover, Health Officer for the township of Hamtramck, Wayne county, by letters dated Feb. 20 and May 16, 1887, wrote to this office as follows:—

---

* § 7965 Howell's Statutes.

"Will you please state the law, if any, in regard to feeding hogs intestines from slaughter-houses, condemned fish from the markets, etc. If they have a right to feed such stuff, at what distance from other people's houses and the highway must they keep with it?

"The stench from such stuff is not very satisfactory to people not engaged in fattening hogs.

"I wrote you sometime ago about some nuisances, but we have some difficulties which I did not mention. Our T. P. line is one of the leading roads which they draw offal on, and it is also a toll road. Now can we stop them coming on that road with offal? If so, how?

"The people from Detroit are drawing rubbish in the shape of tin cans, old bottles, barrels, etc., throwing them in the roads. In some instances filled with animal matter; whether filled or not they are bad in a highway. Can we stop this, too?

"There are also feeding places across the township line in Greenfield township, but situated so as to blow the stench directly to people in Hamtramck; how can those parties have those nuisances abated, they living in one township and the nuisance being in another?

"Any other information which you can give will be gladly received by the township board of health and myself.

"For my part, and of those of our board with whom I have talked, want to make thorough work if we can."

To these letters the Secretary replied, Feb. 28, as follows:—

* * * "The nuisance which you describe is one that can be regulated by the local board of health of your township. The Board can make a general rule that hogs shall not be fed offal and decaying fish. Or it can make a rule that if done it shall be under certain specified restrictions, and only in proper places. The rule must be published, according to law, in some newspaper circulated in your midst, or by posting in public places. I send you by this mail a copy of the Public Health Laws, with sections marked. If there are any points on which you are not yet clear on this matter, please let me know. I will be glad to learn your success in regulating this nuisance."

And again May 17, 1887: "In reply to your letter of May 16, relative to certain alleged nuisances I would say that section 6377 of Compiled Laws of 1871, and section 7965 of Howell's Annotated Statutes gives the circuit court for any county equity jurisdiction in all matters concerning nuisances where there is not a plain, adequate, and complete remedy at law, and authorizes the circuit court to grant injunctions to stay or prevent nuisances. If any number of the citizens of your township are suffering from a nuisance which your board by its regulations cannot suppress, I would suppose that the proper course for your board to pursue would be to have its representative appear before the circuit court, or before the judge sitting in chambers, and get out an injunction. I would advise your board to consult your prosecuting attorney or some equally good lawyer in regard to this case. I would be glad to learn what is done."

ALLEGED NUISANCE—WHEY-BOX AT A CHEESE FACTORY.

August 3, 1887, Dr. J. W. Vandenberg, Health Officer of Olive township, wrote in regard to a whey-box, at a cheese factory, which had been complained of as a nuisance, on the ground that it emitted noxious odors, which might prove detrimental to the health of residents. The local Board of Health had investigated the matter, declared it a nuisance, and ordered it to be abated; but the owner of the box refused to comply with the order of the local board, and the health officer referred the case to the Secretary of the State Board.

In response to Dr. Vandenberg's letter, the Secretary of this board wrote to him Aug. 8, 1887:—

"I send you by this mail one copy of Mr. Parker's paper, * * * * one copy of 'Work of Health Officers,' in which you will find something on nuisances, and one copy of a little document on Petition for the Abatement of a Nuisance. In these you will find the law in regard to nuisances well stated.

"It is the duty of the local Board of Health to investigate all alleged nuisances in its jurisdiction, and if satisfied that they are nuisances, to order their abatement."

Aug. 15, 1887, Mr. B. Wakeman, Supervisor of the township of Algansee, wrote to this office for advice in the following case:—

"Last fall there was a petition, with over 100 signatures, taxpayers in this town and Ovid asking that the "fill" that was placed in the Quincy channel by a decree of the court was a nuisance, and that it be removed, so that the water would not be stagnant. There was a meeting called for the Board of Health from each township, and investigated the same, and we decided that it was detrimental to public health, and that it should be removed, and the decision was referred to county drain commissioner, but he will not act, and we have been told that the *State* gave them, viz., Quincy Lake Channel Company, permit, and now the State will have to attend to it. As we are threatened with a lawsuit, I wish you would attend to it at once." * * * *

In reply to this letter the Secretary of the State Board of Health wrote to Mr. Wakeman, Aug. 17: "I would say that probably the best way to remedy the difficulty, or to abate the nuisance of which your board complains, is to apply to the circuit court of your county for an injunction, ordering the removal of the obstruction in the channel between the lakes, or the entire filling up of the channel. I enclose a little document which gives a very good discussion of the statutes relative to nuisances. I do not know of any State officer authorized to grant such a permit as you mention. Probably you were misinformed on that point. The law is plain, and your board should apply to the circuit court or to the judge sitting in chambers for an injunction."

THE REGULATION OF ORDINARY NUISANCES, PRIVIES, ETC.

The Health Officer of the village of Ashley, B. C. Sickles, M. D., June 21, 1887, writes:—

"I wish you would give me instructions how to compel a person to clean up the filth, etc., upon their premises; for instance, I know of several out-houses which smell badly and should be taken care of, and another located about 20 feet from another residence, and they refuse to remove the same."

In answer to Dr. Sickles' request, the Secretary of the board wrote to him as follows:—

"The best way to regulate outhouses is, in a general way, by the local Board of Health adopting rules which shall prevent such nuisances as far as possible, and directing the health officer to enforce them. The local Board of Health is required by law to investigate all nuisances, and if satisfied that they are nuisances, they should order the abatement of those on private property. If the owner refuses to obey the order he is liable to a fine.

"I send you by this mail a small pamphlet on 'Work of Health Officers,' which contains a short discussion of the subject of nuisances, with reference to the law."

S. A. Johnson, M. D., Health Officer of Kalkaska, wrote, Sept. 19, 1887:—

"Would say that we have a village of about 1,000 inhabitants. Our town is located on sandy plain. Our wells average 18 to 20 feet in depth. The privy vault system is universally used. What would you recommend for us?" * * * *

In reply to Dr. Johnson's letter, the Secretary wrote, Sept. 21, 1887: "It is important that a village, situated as Kalkaska is, should at once get rid of the privy vaults. They are a great danger, and should not be tolerated longer than is absolutely necessary to introduce the dry-earth system. I would particularly call your attention to a paper on 'Decomposing Organic Matter,' by Dr. Kellogg of this board. Your village board of health should by ordinance compel all privy-vaults to be cleaned out and filled up, and the adoption of the dry-earth system. If the care of the dry-earth closets be left to the householders there should be an inspector to visit the closets regularly, to see that they do it properly; but the best plan is to have a village scavenger, who shall go about regularly collecting material from the closets, and removing it to a safe place. The scavenger might also supply householders with dry earth for use in the closets. He should be paid well *by the village*, and should be looked after sharply by the health officer. Any further opinion or information which I can give you will be cheerfully given."

Sept. 26, 1887, Dr. Johnson wrote, asking what method of cleansing the privy vaults, now in use, the board would recommend, stating that some of the vaults have been in use since the town started, in 1872 or 3, and were six to ten feet deep.

To this question the Secretary replied as follows: "I would advise your board, if it is practicable, to have the vaults cleaned out by one of the men in the State who make a business of it. C. H. Vouté, of East Saginaw, is one of them. He has an 'Odorless Excavating Apparatus,' and does satisfactory work. Perhaps he may be going up to your part of the State before long, and thus you might possibly get him to visit Kalkaska at the minimum expense.

"If this cannot be done, the vaults should be thoroughly disinfected with copperas solution, or with chloride of lime, using four ounces of the best quality of chloride of lime to each gallon of material in the vault. After this is done, the vault should be filled up with earth.

"I really hope that your village will abolish the privy-vault nuisance, and that it will become general to do so."

SAWDUST AND SHAVINGS IN A STREAM.

Nov. 21, 1887, the Supervisor of Mayfield township, D. S. Nickerson, wrote, asking what steps could and should be taken to prevent a manufacturer from running saw-dust and shavings from turning lathes into a running stream of water; and stating that the stench from such saw-dust and shavings, accumulated on the banks of the stream, was very disagreeable to inhabitants in the vicinity, who had complained to him.

This letter was answered Nov. 25, 1887, by sending Mr. Nickerson a pamphlet issued by this board, on the Work of Health Officers, in which paragraphs concerning nuisances had been marked; and a letter, stating:—"The Board of Health is required by law to investigate nuisances and order their abatement, but declaring a thing to be a nuisance does not make it so, if it is not one in fact, hence the best way, probably, for your local Board of Health, if convinced that the saw-dust is dangerous to the public health, would be to enter a complaint before your Circuit Court, and thus secure a judicial order for its abatement. This office will be glad to learn what action is taken."

SWAMP NEAR UNION SCHOOL BUILDING.

T. J. Secor, Health Officer of the village of Midland, January 12, 1887, says:—

"I have not been able to investigate as thoroughly as I would wish, I will, however say that there is a swamp of 10 acres in the corporation of this village, and near the Union School building, that has been a receiver of all or nearly all the filth that has been drawn from private places for some time past. I condemned it as a nuisance, and made such a report to the council of this village last spring, and made an effort to have it drained; but I did not succeed in having it done. Please advise me as to the proper course for me to pursue to accomplish it. I believe every doctor here will join me in the statement that it is the prime cause of most of the sickness here. Any information you can give me on the subject will be thankfully received."

The Secretary of the board sent Dr. Secor a document entitled, "Petition for Abatement of an Alleged Nuisance," (which contains a discussion of the law relative to nuisances) and other documents relative to overflowed lands, which it was believed would aid him in his effort to do away with the swamp in question.

RINSING WATER AND WASTE FROM A CREAMERY.

June 14, 1887, The Peerless Creamery Co. applied for information as follows:—

"What can we do, if anything, to deodorize our waste and rinsing water which is carried off through the public sewers of the village by permission of the authorities, but which on finding daylight outside the corporation becomes offensive to the people of the township, and they threaten prosecution.

"The offensive feature is the small quantity of buttermilk, etc., which must necessarily abound in our waste water. * * *

"Is this matter (as offensive as it is) so very dangerous to health as some others?"

In answer to this application the Secretary sent the following letter, dated June 15, 1887, to Mr. S. O. Giddings, manager of the Co.:—

* * * "I presume the difficulty is in the method of disposal. If there are no deep catch-basins in the sewer, and if the sewer empties into a stream of sufficient volume and current to carry off the sewage, there probably would be no trouble. If the sewage in large quantities is emptied upon the ground, at the end of the sewer, and if considerable quantities are kept in deep catch-basins, where it decomposes and becomes offensive, I don't know of any practicable way of disinfecting or deodorizing the sewage so that it will cause no nuisance.

"It might be useful to use chloride of lime or copperas in the sewer, as recommended on pages 3 and 4 of a document on diphtheria, which I enclose; but I would not suppose it would be practicable to use it in quantities sufficient to prevent a nuisance if the method of disposing of the sewage is a bad one. You do not state what is the nature of the disposal at the outfall of the sewer."

PROPOSED CEMETERY NEAR A RESIDENCE.

Mr. R. F. Nimmer, of Roseville, wrote Aug. 12, 1887, sending a plot of the locality, asking the opinion of the Secretary as to whether a proposed cemetery, if located on rising ground near his residence, and under conditions such as he specifies, would be injurious to the health of himself and family.

The Secretary responded as follows:—

"I would say that unquestionably it would be dangerous to live between the six acres used as a cemetery and the county ditch. A well on your lot would almost certainly be contaminated by leachings from the graves; and you would get whatever odors the winds might carry from the cemetery. It is the universal opinion of sanitarians that cemeteries should not be placed near dwelling-houses, nor where population is likely to extend." * * *

WELLS WITHIN SIXTY FEET OF A CEMETERY.

J. F. Hovis, M. D., Health Officer of the village of Au Sable, wrote to the Secretary of the board, Sept. 18, 1887, as follows:—

"Within the limits of the village of Au Sable there is located a small cemetery, and the question has come before the Board of Health, as to the advisability of having it removed. There are severa wells situated within 60 feet of the cemetery, and we think of having samples of the water from four or five of them sent off and analyzed for traces of animal matter. My object in writing you this note is to get your opinion as to the best place to send it for analysis, and also what, in your opinion, would be the effect upon the wells situated thus closely to the cemetery. Our soil is very sandy and close, and the question arises would or would not 'animal matter' filter through such a soil and contaminate the wells within 60 feet from where it is decomposing."

In answer to Dr. Hovis' enquiries the Secretary of the board wrote to him Sept. 22:—

"I would recommend the following chemists as reliable:—Dr. V. C. Vaughan, Ann Arbor, Mich., Prof. A. B. Prescott, Ann Arbor, Mich., Dr. R. C. Kedzie, Agricultural College, Mich.

"You ask for my own opinion as to the danger of contamination of wells 60 feet from your cemetery. I would not like at this distance to give a positive expression in regard to this particular case, except that I should *suspect* the well water of being contaminated, and would hesitate to use it.

"By this mail I send you some pamphlets bearing upon this question which it would pay you to read. The Richland cemetery case, told of by Dr. Vaughan, seems to prove beyond a doubt that contamination from a cemetery 30 rods away is possible." * * *

SCHOOL HOUSE NEAR A CEMETERY.

Mr. Amos Dillon, Health Officer of Carmel, Eaton Co., wrote to the board March 30, 1887, stating that their school house and cemetery are situated very near each other, that they have been in use about forty years, that complaint comes from the school, that during the summer, when the wind is from a certain direction, the windows have to be closed to keep out a stench that seems to come from the graveyard; and asks if such a situation would not be injurious to the health of the pupils.

In reply to Mr. Dillon's letter, the Secretary wrote April 1, 1887:—

"I would say, that as I do not know all the facts bearing upon the question you present, I cannot go much into detail. From what you say, however, I think the present site is not a fit one for a school house and church. Gases *are* given off by some cemeteries; and I would not think it possible to have a well near that cemetery which would not be contaminated by leachings from the graves. I can readily believe that the odor the children complain of comes from the cemetery."

INJURIES FROM UNEVEN SIDEWALKS.

Dr. Joseph Marshall, Health Officer of the village of Gaines, wrote June 2, 1887, that complaints had been made to him of several persons having been hurt by an uneven sidewalk, and asking if the State Board of Health had power to regulate sidewalks. To which the Secretary responded as follows:—"If your village is organized or incorporated under act 62, Laws of 1875, Section nine of the act gives your village council power to establish such lines and grades for sidewalks as it deems best, and it can require sidewalks to be laid on such lines and grades. * * * * There is no doubt that such a sidewalk as you describe is dangerous to public health and safety."

COW YARD ADJOINING RESIDENCE.

A citizen of Ft. Gratiot, wrote July 12, 1887, as follows:—

"Adjoining my home are two vacant lots. * * * The NcNeil Creek runs through them, which of course makes them a sort of marsh. A man named * * * keeps them enclosed, and uses them for a cow-yard, perpetuating as great a nuisance as it is possible to imagine. Most of the people in this vicinity have appealed to the proper authorities here, yet up to date, there has been nothing accomplished. * * * During all last winter they deliberately wheeled the manure from their barn and piled it on the lots to which I referred, almost under my pantry window. I appealed to the health officer several times but it was not moved till spring. * * * I appeal to you as a last resort. * * * I beg you in the name of humanity to use your authority, and have this nuisance done away with."

In reply the Secretary of the Board wrote July 15, 1887, as follows:—

* * * "I would say that the law makes it the duty of the local board of health to examine into all nuisances, *source of filth*, and causes of sickness which may, in their opinion, be injurious to the health of inhabitants, and destroy, remove, or prevent the same as the case may require. If the nuisance be found on private property, the board is required by section 1641, Howell's Statutes, to notify the owner or occupant to remove the same at his own expense within 24 hours. If the owner neglects to do so, he forfeits a sum not exceeding $100.00.

"I would advise you to show this letter to the health officer and to the members of the board with a document on the 'Work of Health Officers' which I send you by this mail.

"If the local board of health refuses to do anything about your complaint, please let me know, and inform me whether you live in the village of Ft. Gratiot, or in some adjoining township."

PROPOSED AMENDMENT OF THE LAW RELATIVE TO NUISANCES.

Dr. E. N. Palmer, Health Officer of Columbia township, wrote April 22, 1887, as follows:—

"Inasmuch as it is expected that local Boards of Health should give to you, if they can, information of any importance, I send the following transcript of the means used by the Board of Health of the township of Columbia to abate a certain nuisance and the result, and by so doing call to your attention the necessity of further legislation upon the subject.

"In June 1886, our attention was called to a certain mill pond to which was attached a mill in process of repair, and not used from April to November of that year. The water at that time had been suddenly lowered some three or four feet, leaving exposed some hundreds of acres usually covered with water. An order signed by the board was served on the occupants to raise the water forthwith. No attention was paid to the order, and the water was raised and lowered at his pleasure until the 6th day of September, when it became so obnoxious and unhealthy, that I made complaint to the prosecuting attorney, by whose order a warrant issued, arrest made, and upon examination he was bound over to the circuit court for trial. Trial had on Monday and Tuesday of this week. Facts proven beyond a doubt. No attempt to make a defense except the necessity of making repairs. The prosecution proved by experts that no lowering of the water was necessary. Case given to jury without argument, and a very ambiguous charge. Result disagreement of the jury.

"It seems to me the law on that subject ought to be changed, so that the declaration of a local board as to a nuisance ought to be *judicial* subject to an appeal to the courts."

In answer to this communication, the Secretary of the Board wrote to Dr. Palmer, April 23, 1887, thanking him for his communication, and saying: "In the case of mill dams causing nuisances or what appear to be nuisances, we usually recommend that the Board of Health proceed under section 6377 of the Compiled Laws of 1871,* which gives the circuit court *equity* jurisdiction in all matters concerning nuisances where there is not a plain, adequate, and complete remedy at law. An injunction may thus be secured to stay or prevent the nuisance before it has time to do much harm. The case is tried by the judge, and not by a jury. The judge can attend to it even if court is not in session."

---

*7965 Howell's Statutes.

GARBAGE FROM DETROIT—ALLEGED POLLUTION OF DETROIT RIVER.

In October and November, 1886, letters were received by the State Board from Drs. J. P. Anderson, of Grosse Isle, E. P. Christian, and T. J. Langlois, of Wyandotte, and H. Holden, of Trenton, relative to the pollution of the Detroit river, below the entrance of the River Rouge, by the sewage and garbage of Detroit. These gentlemen represented that at Grosse Isle, Ecorse, Trenton, and at farms along the river, where the river water is largely used for drinking and culinary purposes, there has been a marked increase of dysentery, typhoid fever, and diphtheria, within the last few years, whereas at Wyandotte, where well water is almost entirely used, the diseases have not been more than usually prevalent. This state of things they attribute to the contamination of the river water by the sewage and garbage of Detroit, and the State Board was asked to investigate the subject.

The State Board of Health, at its regular meeting Jan. 11, 1887, had the question under consideration, and appointed a committee to investigate, and the subject was made the special order for the afternoon of the meeting of the board, in April, 1887, at which time, however, no definite result was reached. An account of the investigation came to the knowledge of the Health Officer of Detroit, Dr. Duffield, who asked for the names and addresses of complainants, in order to correspond with them. The letters were sent to him, and placed before the Detroit Board of Health. The following extract, from a letter dated July 14, 1888, received by the Secretary of the State Board from Samuel P. Duffield, M. D., Health Officer of Detroit, shows the success of the efforts of officers and citizens of Detroit, and along the river below Detroit, and of the recommendations of this board, so far as relates to the garbage of Detroit:—

"We are now under way to burn the garbage, they having let the contract, and I hope in about one month my difficulties as health officer over this troublesome matter will cease. I have had more difficulties with garbage than all other matters combined, and you can imagine how relieved our office will be when we can send all refuse, etc., to the furnace."

Respectfully submitted,
HENRY B. BAKER,
Secretary.

INDEX.

[In this index, unless otherwise stated, the localities mentioned are in Michigan.]

Page.

- **Abbott**, M. D., A. J., weekly reports of diseases by, for Emmet ... 92
- Absolute humidity, relation of, to sickness from pneumonia by months, ten years, Diagram ... 166
  - by months in 1887, at sixteens stations, Table ... 29
    - six stations in 1887, Diagram ... 28
  - average, by year and months in 1887 compared with previous ten years, and with 1886, Table ... 27
  - average, in 1887, compared with previous twenty-one years, and with 1886 at Agricultural College, Exhibit ... 27
- Abstracts of quarterly reports presented by the Secretary, State Board of Health ... xlviii-lx
  - proceedings at meetings of the State Board of Health, fiscal year 1888 ... xxxii-xlvii
- Accessions to library of State Board of Health, by exchange ... xxii-xxiii
  - gift ... xviii-xxii
  - purchase ... xviii
- Actinomycosis (lump-jaw) in cattle, in 1887 ... 280
- Adams, M. D., C. O., weekly reports of diseases by, for Lakeview ... 93
- Adulteration of candies, etc., legislative act relative to ... xxxiv-xxxv
- Agricultural College, near Lansing, meteorological characteristics of the year 1887, at ... 4-5, 6, 7
  - absolute humidity by months, 1887, at, Table ... 29
  - atmospheric pressure by months, 1887, at ... 72, 76
  - average temperature by months, 1887, at ... 19
  - cloudiness, per cent of, by months, 1887, at, Table ... 40
  - extremes and range of temperature by months, 1887, at ... 20, 21
  - fogs, dates of, in 1887, at ... 36-39
  - its latitude, longitude, elevation; also its temperature and atmospheric pressure in 1887 ... 3
  - rainfall by months in 1887, at ... 51
  - range of temperature, daily, by months, 1887, at ... 25
  - relative humidity, by months, 1887, at ... 31
  - temperature by months and year, 1887, at ... 19-26
  - wind, velocity, direction of, etc., in 1887, at ... 64-70
- Air passages, diseases of, how they are caused ... 15
- Albion, abstracts of proceedings of Sanitary Convention held at ... xxxi
- Alcona county, glanders reported from ... 278
- Alexander, S., meteorological reports for Birmingham in 1887, received from ... 2
- Allen, M. D., G. D., weekly reports of diseases by, for Portland ... 93
- Alpena, poisoning at, by buttermilk ... 195
  - absolute humidity by months, 1887, at, Table ... 29
  - atmospheric pressure by months, 1887, at ... 72-76
  - auroras, dates of, observed in 1887, at ... 43
  - average temperature by months, 1887, at ... 19
  - cloudiness, per cent of, by months, 1887, at, Table ... 40

PAGE.
Alpena, extremes and range of temperature by months, 1887, at 20, 21
  fogs, dates of, in 1887, at 36-39
  frosts and other local phenomena, at 8, 9, 11, 12
  halos, solar and lunar, dates of, in 1887, at 48-49
  its latitude, longitude, elevation; also its temperature and atmospheric pressure in 1887 3
  ozone, day and night, by months in 1887, at 54-56
  rainfall by months in 1887, at 51
  range of temperature, daily, by months, 1887, at 25
  relative humidity, by months, 1887, at 31
  sunny and cloudy days in 1887, at 45
  temperature by months and year, 1887, at 19-26
  wind, velocity, direction of, etc., in 1887, at 60-70
Annual reports, by health officers, method of obtaining viii
  clerks of local boards of health, method of obtaining .... viii-ix
Ann Arbor, absolute humidity by months, 1887, at, Table 29
  atmospheric pressure by months, 1887, at 72, 76
  average temperature by months, 1887, at 19
  cloudiness, per cent of, by months, 1887, at, Table 40
  extremes and range of temperature by months, 1887, at 20, 21
  fogs, dates of, in 1887, at 36-39
  frosts and other local phenomena, at 8, 9, 11, 12
  its latitude, longitude, elevation; also its temperature and atmospheric pressure in 1887 3
  ozone, day and night, by months in 1887, at 54, 56
  rainfall by months in 1887, at 51
  range of temperature, daily, by months, 1887, at 25
  relative humidity, by months, 1887, at 31
  sunny and cloudy days in 1887, at 46
  temperature by months and year, 1887, at 19-26
  wind, velocity, direction of, etc., in 1887, at 60-70
Anthrax, supposed, in Kent county, in 1887 281-282
Argentine township, Genesee county, glanders in 277
Asylum for the insane, plans for a cottage at the northern 172-176
  examination of plans for proposed cottages at eastern 178-179
Atmospheric pressure, by months in 1887, eight stations, Diagram 77
  average by year and months in 1887, at fifteen stations and sixteen stations, Table 76
  range of, by year and months in 1887, compared with previous five years, and with 1886, Table 75
  average daily range of, by year and months in 1887, compared with previous five years and with 1886, Table 74
  the average, by year and months in 1887, compared with the previous twelve years, Table 74
  average by year and months in 1887, compared with the average for previous ten years, and for 1886, Table 73
  range of, by year and months in 1887, average monthly range for series of years, Table 72
  average daily range of, in 1887, at each of sixteen stations, Table 71
  tables, exhibits and diagrams relative to 71-77
Auroras, dates of, observed at stations in Mich. in 1887 43
  by months in 1887, at thirteen stations, Exhibit 43
Average disease, total sickness, what it is 140
  sickness from, by year and months 1877-87 141
  for twenty-seven diseases, curve representing per cent of reports of, in 1887 129
  disease, and meteorological canditions, by months in 1887 142

PAGE.

Avery, M. D., Hon. John, President of the State Board of Health, Greenville:
  committee on buildings, including ventilation, heating, etc. vii
    relations of schools to health viii
    plans for model school-houses viii
  date of expiration of term as member of State Board of Health vii
  opinion of, concerning restriction of measles 268
  library books loaned to xxvi
  committee to investigate slaughter houses, near House of Correction at Ionia 171

Bacillus *tuberculosis*, inoculated in susceptible animals causes consumption xxxix
  discovered by Dr. Robert Koch xxxix
  propagation of, in the air-passages favored by cold air xxxix

Badger, M. D., I. W., weekly reports of diseases by, for Big Rapids 92

Baker, Dr. Henry B., on the causation of consumption xxxix
  claims to have discovered "the cause that causes the cause to be effective" in causing consumption xxxix
  Secretary of the Board, Lansing, committee on climate, geology, topography, etc. vii
    committee on Vital Statistics viii
    animal's diseases dangerous to man viii
  library books loaned to xxiv-xxv
  on the "cold weather" cause of consumption xxxix
  report of outbreak of typhoid fever at State Prison at Jackson 186-194
  letter from, concerning the testing of illuminating oils 199
  paper on relations of certain meteorological conditions to diseases of the lungs and air-passages 143-169

Baker, Prof. S. W., library books loaned to xxvii

Baker, M. D., C. T., weekly reports of diseases by, for Decatur 93

Bailey, M. D., N. H., weekly reports of diseases by, for Morenci 94

Bartholemew, M. D., I. H., library book loaned to xxvi

Bartholomew, Harry S., meteorological observations by, at office of State Board of Health, Lansing, in 1887 2

Barnett, M. D., G. G., weekly reports of diseases by, for Ishpeming 92

Barometer, relation of daily range of, to pneumonia, by months, four years, diagram 158

Bath, Clinton county, alleged nuisance at 287-288

Bartwell, M. D., E., weekly reports of diseases by, for Ypsilanti 94

Battle Creek, reported poisoning at, by pressed corn beef 196
  absolute humidity, by months, 1887, at, Table 29
  average temperature, by months, 1887, at 19
  cloudiness, per cent. of, by months, 1887, at, Table 40
  extremes and range of temperature, by months, 1887, at 20, 21
  its latitude, longitude, elevation; also its temperature and atmospheric pressure in 1887 8
  ozone, day and night, by months, in 1887, at 54, 56
  rainfall, by months, in 1887, at 51
  range of temperature, daily, by months, 1887, at 25
  relative humidity, by months, 1887, at 31
  sunny and cloudy days in 1887, at 47
  temperature, by months and year, 1887, at 19-26
  wind, velocity, direction of, etc., in 1887, at 67-70

Bangham, A. D., letter from, concerning an outbreak of measles 269

Bay City, reported poisoning at, by ice cream 195
  reported poisoning at, by head cheese 196
  severe burning by gasoline, at 201

Beale, Dr. Lionel S., researches of, regarding chloride of sodium in pneumonia 145

Beebe, Arthur, meteorological reports for Gulliver Lake in 1887, received from 2

PAGE.
Beebe, M. D., R. P., weekly reports of diseases by, for Union City 94
Beardslee, M. D., S. T., weekly reports of diseases by, for Armada 94
Bell, M. D., G. M., weekly reports of diseases by, for Benton Harbor 93
Blagborne, M. D., F., weekly reports of diseases by, for Marine City 93
Blanks and diagrams for distribution, list of xxvii
Bliss, M. D., L. W., weekly reports of diseases by, for Saginaw 93
Bloomfield township, Huron county, suspected glanders at, reported from 278
Blowers, on emery wheels, law to provide for xxxvi
Brain, inflammation of, curve representing rise and fall of, in Mich., months, 1887, Diagram 5. 129
Bronchitis, curve representing rise and fall of, by months, in 1887, Diagram 87
    caused by inhalation of cold, dry air 145
    in London, Eng., relation of, to average atmospheric temperature, by months, thirty years, Diagram 163
    Table 169
    prevalence of, by months, in 1887, and meteorological conditions 119
    sickness from, by months, in 1887, and in each of ten years 118
    relations of, to meteorological conditions 116
    sickness from 118
    and meteorological conditions 119
    relation of, to average atmospheric temperature, by months, nine years, Diagram 154
    Table 167
    relations of, to meteorological conditions 116-117
Brumfield, M. D., E., weekly reports of diseases by, for Union City 94
Boies, Lieut. A. H., meteorological reports for Hudson, in 1887, received from 2
Bolger, deputy oil inspector, letter from, concerning a fire from over heated lamp 198
Bower, M. D., H. L., weekly reports of diseases by, for Greenville 93
Bowels, inflammation of, curve representing rise and fall of, by months, in 1887, Diagram 5 129
Birmingham, absolute humidity by months, 1887, at, Table 29
    atmospheric pressure by months, 1887, at 72-76
    auroras, dates of, observed in 1887, at 43
    average temperature by months, 1887, at 19
    cloudiness, per cent of, by months, 1887, at, Table 40
    extremes and range of temperature by months, 1887, at 20-21
    fogs, dates of, in 1887, at 36-39
    frosts and other local phenomena at 10, 11, 12
    halos, solar and lunar, dates of in 1887, at 48-49
    its latitude, longitude, elevation, also its temperature and atmospheric pressure in 1887 8
    ozone, day and night, by months in 1887, at 54-56
    rainfall by months in 1887, at 51
    range of temperature, daily, by months, 1887, at 25
    relative humidity, by months, 1887, at 31
    temperature by months and year, 1887, at 19-26
    wind, velocity, direction of, etc., in 1887, at 64-70
Buckley, M. D., E. P., weekly reports of diseases by, for Litchfield 94
Budd, M. D., W. H., weekly reports of diseases by, for Sheridan 93
Budge, M. D., J. L., weekly reports of diseases by, for Coleman 92
Bulletins of health in Michigan 82
Burgess, M. D., J. M., weekly reports of diseases by, for Northville 94
Burroughs, M. D., O. F., weekly reports of diseases by, for Harbor Springs 92
Burnham, M. D., W. A., weekly reports of diseases by, for Rockland 92
Butler, M. D., C. M., weekly reports of diseases by, for Morenci 94
Buttermilk, poisoning by, at Alpena 195
Cameron, M. D., D. A., weekly reports of diseases by, for Alpena 93
Candies, law to prevent adulteration of xxxiv
Card reports by physicians, plan of the weekly 80-81
Carey, M. D., H., weekly reports of diseases by, for Croswell 92

PAGE.

- Carnes, M. D., G. D., weekly reports of diseases by, for South Haven 93
- Carpenter, M. D., J. H., weekly reports of diseases by, for Clare 92
- Cars (railroad) Act relating to heating of xxxvi
- Car heating, legislation relative to xxxvi
- Caughlin, M. D , J. W., weekly reports of diseases by, for Bay City 92
- Caulkins, M. D., J. S., weekly reports of diseases by, for Thornville 93
  - meteorological reports for Thornville in 1887, received from 2
- Causes of sickness, contributions to the study of the 79-142
- Causation of consumption, remarks by Dr. Baker on xxxix
- Cerebro-spinal meningitis, curve representing rise and fall of, by months in 1887, Diagram 3. 135
- Chappel, Geo. M., meteorological reports for Mackinaw City in 1887, received from 2
- Chase, M. D., Milton, meteorological reports for Otsego in 1887, received from 2
  - weekly reports of diseases by, for Otsego 93
- Children, law relative to employment of xxxvi
- Chippewa Lumber Company, letter to 290
- Chippewa Lake, alleged nuisance at 289
- Chloride of Sodium, in the causation of pneumonia and other diseases of the lungs and air passages .... xxxix, 145, 146, 147, 150, 151
- Cholera infantum, relation of to meteorological conditions 130
  - in 1887, compared with 1886 and ten years 1877-86 133
  - relation of, to meteorological conditions 130-131
  - and meteorological conditions, by months in 1887, Exhibit 132
  - curve representing rise and fall of, by months in 1887, Diagram 87
  - per cent of reports of, in 1887, compared with previous years, Exhibit.... 133
- Cholera morbus, curve representing rise and fall of, by months in 1887, Diagram 87
- Christian, M. D., E. P., weekly reports of diseases by, for Wyandotte 94
- Clancy, M. D., C. C., weekly reports of diseases by, for Port Huron 93
- Clapp, M. D., H. C., weekly reports of diseases by, for Menuon 94
- Clark, M. D., James T., letter from, concerning an alleged nuisance 289
- Clark, M. D., L. E., weekly reports of diseases by, for Otsego 93
- Clark, M. D., W. B., weekly reports of diseases by, for Douglass 93
- Clerks of local boards of health, methods of obtaining annual report of .... viii-ix
- Cleveland, M. D., G. H., weekly reports of diseases by, for Pentwater 92
- Climate and sickness 116
  - relations of 116
- Clizbe, W. D., meteorological reports for Ionia in 1887, received from 2
- Cloudiness, per cent of, in 1887, compared with preceding years, at Agri'ral College, Exhibit... 42
    - at stations, Exhibit 42
  - average per cent of, by months in 1887, seven stations, Diagram 41
    - at seventeen stations, Table 40
  - table, diagram, and exhibits relative to 40-42
- Clouds, sunshine and, in 1887, by months, at stations 43-47
- Cochran, M. D., C. F., weekly reports of diseases by, for West Branch 92
- Cogshall, M. D., Bela, library book loaned to xxv
- Cold-weather diseases, order of succession of some of the 144
  - summary, how many times certain propositions held true 138
- Cole, M. D., D. H., weekly reports of diseases by, for Memphis 94
- Collection and compilation of information .... viii-xiv
- Committees, standing, of State Board of Health .... vii-viii
- Communicable diseases during the year ending December 31, 1887 222-270
- Compensation of health officers xliv
- Compilation and collection of information .... viii-xiv
- Confectioneries, law to prevent adulteration of xxxiv
- Congress, International Medical, Washington, D. C., Sept., 1887 xxxviii
- Conrad, F. W., meteorological reports for Detroit in 1887, received from 2
- Consumption, pulmonary, relation of, to atmospheric temperature 149
  - and meteorological conditions, by months in 1887 127

PAGE.
Consumption, pulmonary, curve representing per cent of reports stating presence of, 1887 129
in 1887, and meteorological conditions 127
curve representing rise and fall of, months, 1887, Diagram 5 129
sickness from, in 1887 compared with ten years, 1877-'86 128
narrow lymph spaces, hyperinosis, atmospheric ozone, and sodium chloride, in the causation of 148, 150
relation of to average atmospheric temperature, by months, nine years, Diagram 162
Table 169
increase and decrease of sickness from, follow falling and rising temperature of the atmosphere 162, 169
the causation of, remarks by Dr. Baker on xxxix
prevalence of, in ten years, exhibit 128
Contagium, source of, in diphtheria in 1887 226-230
Cook, M. D., J. B., weekly reports of diseases by, for Saugatuck 93
Corn beef, pressed, reported poisoning by, at Battle Creek 196
Corrections and Charities, State Board of, resolutions by, on sanitary inspection of poor-houses and State institutions xiv
resolutions by, relative to dietary of State institutions xliv
Coryga, how it is sometimes caused 145
Counties in each geographical division in Michigan, Exhibit I 85
Couplers, car, automatic, law to provide for use of, in Michigan xxxv
Coveny, M. D., M. J., weekly reports of diseases by, for Emmett 93
Cowles, M. D., A. G., weekly reports of diseases by, for Durand 93
Crosby, M. D., G. W., weekly reports of diseases by, for Ludington 92
Croup, membranous, and meteorological conditions in 1887 120
curve representing rise and fall of, months, in 1887, Diagram 2 121
by months in 1887, compared with ten years 122
relation of, to average atmospheric temperature, by months, ten years, Diagram 164
Table 169
Cullis, M. D., T. A., weekly reports of diseases by, for Vassar 93
Cunningham, David, letter from, on alleged nuisance at Marshall 288-289
Curnalia, M. D., J. H., weekly reports of diseases by, for Attica 92
Dangers, in gasoline xliii
from the use of gasoline xxxiii
Dead animals, burial of 285
Dead horses, feeding hogs on the flesh of 284-285
Detroit, absolute humidity by months, 1887, at, Table 29
atmospheric pressure by months, 1887, at 72, 76
average temperature by months, 1887, at 19
cloudiness, per cent of, by months, 1887, at, Table 40
extremes and range of temperature by months, 1887, at 20, 21
fogs, dates of, in 1887, at 36, 39
its latitude, longitude, elevation; also its temperature and atmospheric pressure in 1887 3
rainfall by months in 1887, at 51
range of temperature, daily, by months, 1887, at 25
relative humidity, by months, 1887, at 31
temperature by months and year, 1887, at 19, 26
wind, velocity, direction of, etc., in 1887, at 60, 70
garbage from, alleged pollution of Detroit river 297
small-pox at 274
Dent, W. W., meteorological reports for Marquette in 1887, received from 2
Diagrams, manner of reading, and construction of 151
and blanks for distribution by State Board of Health xxvii

PAGE.
Diagram I., average temperature by months in 1887, at each of 6 stations and average for 17 stations 18
  II., average daily range of temperature, by months, in 1887, at each of 9 stations, and average for 17 stations 24
  III., absolute humidity, by months, at each of 6 stations, in 1887, and average for 16 stations 28
  IV., relative humidity, by months, at each of 8 stations, and average for 18 stations 30
  V., fogs, number of days on which observed at one or more of 18 stations in 1887 35
  VI., cloudiness, average per cent of, at each of 8 stations, by months in 1887, and average for 17 stations 41
  VII., rainfall, by months, at each of 7 stations, and average for 17 stations in 1887 50
  VIII., ozone, average day, by months, at each of 6 stations, in 1887, and average for 11 stations 55
  IX., ozone, average night, by months, at each of 7 stations, in 1887, and average for 11 stations 57
  X., velocity of wind, by hours and months, 1887, at State Capitol, Lansing, and average for 12 months 59
  XI., velocity of wind, by months, in 1887, at each of 8 stations, and average for 8 stations 61
  XII., wind, direction of, proportion of observations at each of 14 stations, each month in 1887 66
  XIII., wind, direction of, proportion of observations, average for 17 stations, each month, 1887 62
  XIV., wind, direction of, proportion of observations, average for 17 stations and for each of 17 stations in 1887 64
  XV., atmospheric pressure, by months, in 1887, at each of 7 stations, and average for 15 stations 77
  1, per cent of reports which stated presence of bronchitis, pneumonia, diarrhea, dysentery, cholera morbus, and cholera infantum, in 1887 87
  2, per cent of reports which stated presence of tonsilitis, influenza, scarlatina, membranous croup, diphtheria and small-pox, in 1887 121
  3, per cent of reports which stated presence of intermittent fever, remittent fever, typho-malarial fever, typhoid fever and cerebro-spinal meningitis, in 1887 135
  4, per cent of reports which stated presence of rheumatism, neuralgia, erysipelas, inflammation of kidney, measles, whooping-cough and puerperal fever, in 1887 128
  5, per cent of reports which stated presence of pulmonary consumption, inflammation of bowels, inflammation of brain, and the average for 27 diseases, in 1887 129
No. 1, temperature and sickness from influenza, 10 years, 1877-86 152
  2, temperature, and sickness from tonsilitis, 8 years, 1879-86 153
  3, temperature, and sickness from bronchitis, 9 years, 1877-85 154
  4, temperature, and sickness from pneumonia, 8 years, 1877-84 155
  5, temperature and sickness from pneumonia in U. S. armies, 3 years, 1862-64 156
  6, temperature, and deaths from pneumonia in London 30 years. 1845-74 157
  7, daily range of barometer, and sickness from pneumonia, 4 years, 1882-85 158
  8, temperature, and sickness from scarlatina, 10 years, 1877-86 159
  9, temperature, and deaths from small-pox in London, 30 years, 1845-74 160
  10, temperature, and deaths from phthisis in London, 30 years, 1845-74 161
  11, temperature, and sickness from consumption, 9 years, 1878-86 162
  12, temperature, and deaths from bronchitis in London, 30 years, 1845-74 163
  13, temperature, and sickness from croup, 10 years, 1877-86 164
  14, temperature, and sickness from "Respiratory Diseases," in India, 3 years, 1883-5 165
  15, absolute humidity, and sickness from pneumonia, 10 years, 1877-86 166
  — diphtheria in 1887, average cases and deaths per outbreak 236
  — scarlet fever in 1887, average cases and deaths per outbreak 250

PAGE.

Diarrhea, relations of to meteorological conditions 128
 and cholera infantum in 1887, and meteorological conditions 132
 curve representing rise and fall of by months in 1887, Diagram 87
 and meteorological conditions, by months, in 1887, Exhibit 132
 per cent of reports of, in 1887, compared with previous years, Exhibit 133
 relation of to meteorological conditions 128
Dickinson, M. D., W. L., weekly reports of diseases by, for East Saginaw 93
Diet and treatment in diseases of the lungs and air passages 147
Dietary of State institutions, investigation of by the State Board of Health xliv
Diphtheria, mild and suspected cases should be reported, resolutions xli
 curve representing rise and fall of, by months, in 1887, Diagram 121
 and meteorological conditions, by months, in 1887 124
 per cent of reports of, in 1887, '86, and average for ten years 122
 outbreaks probably traced to former cases 228
 period of incubation of 237
 how long will its contagium remain active 238-239
 outbreak in an unfortunate locality 234
 practical results in restricting 234-237
 result of isolation and disinfection, Table 235
  Diagram 231
 number of reported outbreaks, localities, cases and deaths in 1887, Table 226
 outbreaks attributed to unsanitary conditions 229-230
 traced to a former case 227-228
 differences in diagnosis 230-231
 measures taken to restrict—results 231-232
 by months in 1887, compared with ten years 122
 curve representing rise and fall of, months, in 1887, Diagram 2 121
 and Tonsilitis, and meteorological conditions 124
 difficulties in its restriction .... xl-xli
 mild cases of, in adults, may cause fatal cases in children xli
 resolutions of the Board relative to doubtful cases of xli
 during year ending December 31 1887 223-239
 in 1887, compared with previous years 225-226
 map showing distribution of, in 1887 224
 in Livonia, Wayne county .... xlv-xlvi
 method of restricting the spread of, Prof. Henry F. Lyster, on .... xlv-xlvi
Diseases, cold weather 138
 warm weather 139
 prevalence of, in 1887 82
 from which there was marked increase or decrease of, in 1887 84
 time of greatest prevalence of each 79
 weekly reports of, in Mich., in 1887 98-107
 summary relative to prevalence in divisions of Mich., for 1887 .... 108, 109
 which cause most sickness 110
 from which there seems to have been most sickness in Michigan in 1887 111-113
 relative to which weekly reports were received 86
 average of 27, curve representing rise and fall of 129
 from which there was a marked increase or lessened prevalence in 1887 84
 the time of greatest prevalence of each 78-142
 per cent. of reports of, by months, in 1887, Exhibit 86
 in 1887, the prevalence of the several 82-83
 per cent. of reports stating presence of, in 1887, and previous years, Exhibit 89-91
 which cause most sickness in Michigan 110
 from which there seems to have been most sickness in 1887 and four preceding years, Exhibit 111-113
Disinfection and isolation, table exhibiting effects of, in the restriction of scarlet fever .... xxxiv.
Dispennett, M.D., A. J., weekly reports of diseases by, for Berrien Springs 93
Dissemination of information by State Board of Health xv

PAGE.
Divisions of the State, exhibit of the counties in each of the.......... 85
Downer, M. D., F. J., letter from, concerning typhus fever.......... 282-283
Drake, W. T., meteorological reports for Marshall in 1887, received from.......... 2
Drake, M. D., A. P., weekly reports of diseases by, for Hastings.......... 93
Dress, influence of, on respiration..........xli.-xlii.
Drouth, in 1887, in Michigan and other States.......... 4
Dry-closet system of disposal of excreta, report of committee on.......... xlii.
Duffield, M. D., Samuel P., extract of letter from, relative to burning of garbage at Detroit.. 297
letter from, on sale of meat of lump-jawed cattle in Detroit....... 280-281
Dunlap, M. D., J. D., weekly reports of diseases by, for Alpena.......... 92
Dunning, M. D., I. R., weekly reports of diseases by, for Benton Harbor.......... 93
Dunton, Jr., M. D., A. A., weekly reports of diseases by, for Hart.......... 92
Dysentery, curve representing rise and fall of, by months, in 1887, Diagram.......... 87
East Saginaw, fogs, dates of, in 1887, at.......... 36-39
water supply and filter..........xxxviii, xlv
Edmondson, Wm. M., meteorological reports for Port Huron, in 1887, received from.......... 2
Ellis, M. D., L. S., weekly reports of diseases by, for Manistee.......... 92
Elsworth, M. D., A. M., weekly reports of diseases by, for Lowell.......... 92
Epidemic of pneumonia in Ingham county.......... xlv
Erysipelas, curve representing per cent. of reports of, in 1887.......... 123
Escanaba, absolute humidity, by months, 1887, at, Table.......... 29
atmospheric pressure, by months, 1887, at.......... 72, 76
auroras, dates of, observed in 1887, at.......... 43
average temperature, by months, 1887, at.......... 19
cloudiness, per cent. of, by months, 1887, at, Table.......... 40
extremes and range of temperature, by months, 1887, at.......... 20, 21
fogs, dates of, in 1887, at.......... 36-39
frosts and other local phenomena, at..........8, 9, 11, 12
halos, solar and lunar, dates of, in 1887, at.......... 48-49
its latitude, longitude, elevation; also its temperature and atmospheric pressure, in 1887.......... 3
ozone, day and night, by months, in 1887, at.......... 54, 56
rainfall, by months, in 1887, at.......... 51
range of temperature, daily, by months, 1887, at.......... 25
relative humidity, by months, 1887, at.......... 31
sunny and cloudy days in 1887, at.......... 44
temperature, by months and year, 1887, at.......... 19-26
wind, velocity, direction of, etc, in 1887, at.......... 60-70
Eslow, J. C., library books loaned to.......... xxvii
Estabrook, J., Supt. Public Instruction, approval of circular on plans for model school houses.......... xiii
Evans, M. D., E. B., weekly reports of diseases by, for Farwell.......... 92
Ewing, Prof. J. W., meteorological reports for Ionia, in 1887, received from.......... 2
Excreta, Smead's "dry closet" method of disposing of..........xxxviii, xlii-xliii
drying system for disposal of.......... xxxii
report of committee of State Board of Health on.......xlii-xliii
Expenditures on account of the State Board of Health, how provided for.......... xxix
by the State Board of Health for fiscal year 1888, and calendar year 1887.......... xxix
Exhibit 1, names of observers, whose reports are summarized in meteorological tables, etc...
2, latitude and longitude, elevation above sea level, average temperature, average barometric pressure, in 1887 at stations in Michigan..........
3, meteorological conditions, in 1887 at the Agricultural College.......... 6-7
4, well-water observations, at 7 stations in Michigan, in 1887.......... 14-15
5, average temperature, by years and months, 1887, at stations in Michigan.......... 17
6, comparison of average temperature in 1887, with 1886, and with the 23 years, 1864-86 at the Agricultural College.......... 22
7, average temperature, 8 years, 1879-86, at office of State Board of Health, Lansing... 22
8, average daily range of temp., at stations in Michigan, in 1887, compared with averages for 8 years, 1879-86.......... 23

PAGE.

Exhibit 9, comparison of average daily range of temp. in 1887, with averages for 13 years, 1874-86, at the Agricultural College 23
10, comparisons of extremes and the range of temperature in 1887, with the average of extremes and range for fourteen years, 1873-86 26
11, average absolute humidity at stations in Michigan, in 1887, compared with 1886 and the ten years, 1877-86 27
12, comparison of the average absolute humidity for 1887, with averages for 1886, and for the 21 years, 1866-86, at the Agricultural College 27
13, average relative humidity, in 1887, compared with 1886, and the nine years, 1878-86 32
14, comparison of average relative humidity of the air for 1887, with 1886 and for 23 years, 1864-86, at the State Agricultural College 32
15, 16, 17, fogs at stations in Michigan in 1887 34-39
18, cloudiness at stations in Michigan in 1887, compared with 1886 and the ten years, 1877-86 42
19, cloudiness at the Agricultural College in 1887, compared with 1886, and the 23 years, 1864-86 42
20, dates of auroras observed at stations, in 1887 43
21, dates of solar and lunar halos at stations in 1887 48-49
22, rainfall and melted snow at stations in Mich., in 1887, compared with 1886, and the ten years, 1877-86 52
23, rainfall at the Ag'l College in 1887, compared with 1886 and the 23 years, 1864-86 52
24, 25, average amount of day and night ozone at stations in Mich., in 1887, compared with 1886 and the ten years, 1877-86 53
27, average velocity of wind at the office of the State Board of Health in 1887, compared with 1886 and the 7 years, 1880-86 60
26, average velocity of wind at stations in Mich., in 1887, compared with 1886, and the 5 years, 1882-6 62
28, direction of wind at stations in Mich., for the 9 years, 1878-86 63
29, average atmospheric pressure at stations in Mich., in 1887, compared with 1886 and the ten years, 1877-86 73
30, average atmospheric pressure at the Ag'l College, 1887, compared with 1886, and the 12 years, 1875-86 74
31, average daily range of atmospheric pressure at stations in Mich., in 1887, compared with 1886, and the five years, 1882-86 74
32, range of atmospheric pressure (monthly and yearly) at stations in Mich., in 1887, compared with 1886 and average for five years, 1882-86 75
I., geographical divisions of the State 85
II., for each of 27 diseases, for the ten years ending Jan. 1, 1887, and for each of those years, on what per cent of reports received each disease was stated to be present 86
III., by months, of the year ending Dec. 31, 1887, for the State, and for each of the geographical divisions of the State, from which weekly reports were received, the number of observers, etc. 88
IV., for each of 27 diseases, for ten years ending Jan. 1, 1887, and for 1887, on what per cent of the reports received the diseases were stated to be present 89-91
V., names of observers, whose weekly reports of diseases for 1887 are compiled in Tables 1, 2, 3 and 4 92-94
VI., diseases from which there seems to have been most sickness in 1887 111
VII., by divisions, the fifteen diseases from which there seems to have been most sickness in 1887 112-113
VIII., stations where observations of meteorological conditions used in certain exhibits were made 114
IX., certain meteorological conditions at stations in 1887, compared with preceding years 115
X., bronchitis and meteorological conditions, by months, in 1887 119
XI., sickness from bronchitis, by year and months, ten years, 1877-1886 118
XII., pneumonia and membranous croup and meteorological conditions, by months, in 1887 120

PAGE.

- Exhibit XIII., per cent. of reports of certain diseases, by months, for 1887, compared with the preceding year and the preceding ten years 122
  - XIV., diphtheria and tonsilitis and meteorological conditions, by months, in 1887 124
  - XV., influenza and scarlet fever and meteorological conditions in 1887 125
  - XVI., rheumatism and neuralgia and meteorological conditions in 1887 126
  - XVII., consumption and meteorlogical conditions, by months, in 1887 127
  - XVIII., sickness from consumption, by year and months in each of ten years, 1877-86 128
  - XIX., diarrhea and cholera infantum, and meteorological conditions, by months in 1887 132
  - XX., per cent of reports of certain diseases in 1887, compared with the preceding year and the preceding ten years 133
  - XXI., intermittent and remittent fevers, and meteorological conditions, by months in 1887 134
  - XXII., typhoid and typho-malarial fever, and meteorological conditions, by months in 1887 136
  - XXIII., measles and whooping-cough and meteorological conditions, by months in 1887 137
  - XXIV., summary relative to how many times propositions hold true in exhibits on pages 119-126 138
  - XXV., summary relative to how many times certain propositions hold true in exhibits on pages 132-137 139
  - XXVI., sickness from average disease by year and months for each of 11 years 141
  - XXVII., the average of twenty-seven diseases and meteorological conditions, by months in 1887 142
- **Fasquelle**, M. D., L. W., weekly reports of diseases by, for St. Johns 93
- Fay, M. D., C. E., weekly reports of diseases by, for Assyria 93
- Felch, M. D., T. A., weekly reports of diseases by, for Ishpeming 92
- Final reports of outbreaks of dangerous diseases, and blank .... xiii.-xiv.
  - blank for accessory .... xiv.
- Fitz Gerald, James J., meteorological reports for Alpena in 1887, received from 2
- Flint, a supposed rabid dog at 279
- Fogs, number of days on which were recorded, in 1887 at stations, exhibit 36-39
  - curve representing number of different days on which were reported in 1887, diagram 35
  - in 1887 34-39
  - exhibits and diagram relative to 34-39
- Forestry Commission, act to provide for in Michigan .... xxxvii.
- Formad, Dr. H. F., on structural condition predisposing to tuberculosis 148, 150
- Forsyth, M. D., A. H., weekly reports of diseases by, for Lakeview 93
- Frosts and other local meteorological phenomena in 1887, by months 8-12
- **Gamber**, M. D., W. P., weekly reports of diseases by, for McBride 93
- Gardner, M. D., L. W., weekly reports of diseases by, for Harbor Springs 92
- Gasoline, a proposed law to promote safety in the use of 201
  - fire from, in Jackson 200
  - fatal burning by, in Hastings 200-201
  - supposed fatal burning by, at Marshall 201
  - severe burning by, at Bay City 201
  - in 1887, dangers from the use of 200-201
  - dangers from the use of xxxiii
  - proposed circular on dangers in the use of xxxix
  - dangers in the use of xliii
- Gass, M. T., library book loaned to xxvi
- Gates, safety, act to provide for on swing and draw bridges xxxvii
- Geographical divisions of the State, counties included in, Exhibit 85
  - names of reporters in and number of reports from, in 1887 92-94
- Gerhard, C. E., Wm. Paul, on house drainage lviii
- Germs, typhoid, probably not destroyed by drying xxxiii
- Glanders, during the year 1887 276-279
  - in London township, Monroe county 276-279
  - in Argentine township, Genesee county 277
  - in Meade township, Huron county 277

PAGE.

Glanders, in the village of Newberry, Luce county 277-278
  reported from Alcona county 278
  at Three Rivers, St. Joseph county 278
  suspected, in Bloomfield township, Huron county, and near Sheridan, Montcalm county 278
  House bill relative to restriction of xxxv
Gordon, M. D., G. G., meteorological reports for Swartz Creek in 1887, received from 2
Graham, M. D., F. W., weekly reports of diseases by, for Ludington 92
Grand Haven, absolute humidity by months, 1887, at, Table 29
  atmospheric pressure by months, 1887, at 72, 76
  average temperature by months, 1887, at 19
  cloudiness, per cent of, by months, 1887, at, Table 40
  extremes and range of temperature by months, 1887, at 20, 21
  fogs, dates of, in 1887, at 36-39
  frosts at 8, 11, 12
  halos, solar and lunar, dates of, in 1887, at 48-49
  its latitude, longitude, elevation; also its temperature and atmospheric pressure in 1887 3
  ozone, day and night, by months in 1887, at 54, 56
  rainfall, by months, in 1887, at 51
  range of temperature, daily, by months, 1887, at 25
  relative humidity, by months, 1887, at 31
  temperature by months and year, 1887, at 19-26
  wind, velocity, direction of, etc., in 1887, at 60-70
Gray, M. D., M. W., weekly reports of diseases by, for Pontiac 94
  letter from, on outbreak of typhoid fever 258
Greenshields, M. D., Wm., weekly reports of diseases by, for Romeo 94
Ground-water, average inches of earth above, by months, 1885, 86, 87 lvi
  measurements and temperature of 13-15
  relation of sickness from typhoid fever to height of 253
Grover, Dr. Fred, letter from, on alleged nuisance 290
Gulliver Lake, absolute humidity, by months, 1887, at, Table 29
  auroras, dates of, observed in 1887, at 43
  average temperature, by months, 1887, at 19
  cloudiness, per cent. of, by months, 1887, at, Table 40
  extremes and range of temperature, by months, 1887, at 20, 21
  fogs, dates of, in 1887, at 36-39
  frosts and other local phenomena, at 8, 11, 12
  halos, solar and lunar, dates of, in 1887, at 48-49
  its latitude, longitude, elevation; also its temperature and atmospheric pressure in 1887 3
  rainfall, by months, in 1887, at 51
  range of temperature, daily, by months, 1887, at 25
  relative humidity, by months, 1887, at 31
  sunny and cloudy days in 1887, at 47
  temperature, by months and year, 1887, at 19-26
  wind, velocity, direction of, etc., in 1887, at 67-70
Gunn, M. D., A., weekly reports of diseases by, for New Haven 94
Hagan, George Hass, meteorological reports for Escanaba in 1887, received from 2
Hahn, Ph. D., H. C., library book loaned to xxvi
Halos, dates of solar and lunar, by months, in 1887, Exhibit 48-49
  solar and lunar, dates of, observed at stations in 1887 48-49
Hammond, M. D., L. C., weekly reports of diseases by, for Clarkston 94
Harrisville, atmospheric pressure, by months, 1887, at 72, 76
  auroras, dates of, observed in 1887, at 43
  cloudiness, per cent. of, by months, 1887, at, Table 40
  extremes and range of temperature, by months, 1887, at 20, 21
  fogs, dates of, in 1887, at 36-39

PAGE.

Harrisville, its latitude, longitude, elevation; also its temperature and atmospheric pressure in 1887 ... 3
    ozone, day and night, by months, in 1887, at ... 54, 56
    rainfall, by months, in 1887, at ... 51
    range of temperature, daily, by months, 1887, at ... 25
    wind, velocity, direction of, etc., in 1887, at ... 64-70
Harris, M. D., A. J., weekly reports of diseases by, for Essexville ... 93
Harrison, Clare county, an alleged nuisance at ... 288
Harrington, Prof. M. W., meteorological reports for Ann Arbor, in 1887, received from ... 2
Hartson, M. D., O. S., weekly reports of diseases by, for Parma ... 94
Haskin, M. D., A. S., weekly reports of diseases by, for Lawrence ... 93
Hastings, fatal burning by gasoline in ... 200-201
Hathaway, M. D., W. B., weekly reports of diseases by, for Bloomingdale ... 93
Havens, M. D., G. C., weekly reports of diseases by, for North Muskegon ... 92
Haynes, M. D., J. B., weekly reports of diseases by, for Dundee ... 94
Hazlewood, M. D., Arthur, of committee to investigate slaughter houses near House of Cortion at Ionia ... 171
    weekly reports of diseases by, for Grand Rapids ... 92
    library book loaned to ... xxvi
    committee on finances of the Board ... viii
    committee on mental hygiene ... viii
    committee on plans for model schoolhouses ... viii
    committee on alcoholic liquors ... viii
    date of expiration of term as member of State Board of Health ... vii
Head cheese, reported poisoning by, at Bay City ... 196
Health in Michigan, bulletin of, meteorological data for ... 5
    in the second quarter of 1887 ... xlix
    in the third quarter of 1887 ... li
    in the fourth quarter of 1887 ... liv
    in the first quarter of 1888 ... lix
    bulletins of, data for, relating to sickness ... 82
Health bulletins, weekly and monthly, compilation of, from weekly reports of diseases ... ix
    in Michigan, weekly and monthly ... 82
Health laws, transgression of ... 232-234, 247-248
Health officers, number reported to the State Board of Health, 1887-8 ... ix
    compensation of ... xliv.
    method of obtaining annual reports of ... viii.
    method of obtaining names and addresses of ... ix.
    how can township, legally abate a nuisance ... 283-284
    instructions, pamphlets, etc., sent to ... x.
Heath, M. D., C. F., weekly reports of diseases by, for Monroe ... 94
Hektograph work, No. of pages made during one quarter ... lii.-liv.
Hemenway, M. D., H. B., weekly reports of diseases by, for Kalamazoo ... 94
Hemlock plant, poisoning by, at Ann Arbor, reported by Prof. Victor C. Vaughan ... xlvii.
Hincks, M. D., J. F. weekly reports of diseases by, for Manistee ... 92
Hinds, Hon. H. H., letter from, on sale of meat from lump-jawed cattle ... 281
    President of State Live Stock Sanitary Commission ... 277
Hitchcock, M. D., Homer O., library books loaned to ... xxiii.
Hitchcock, M. D., H. R., weekly reports of diseases by, for Sand Beach ... 93
Homer, a doubtful case of hydrophobia at ... 279-280
Horn, M. D., O. P., weekly reports of diseases by, for Niles ... 93
House of Correction at Ionia, report of alleged nuisance near ... 170-171
Howland, M. D., G. W., weekly reports of diseases by, for Flint ... 93
Hudson, extremes and range of temperature by months, 1887, at ... 20-21
    frosts and other local phenomena at ... 9, 11, 12
    halos, solar and lunar, dates of in 1887, at ... 48-49
    its latitude, longitude, elevation; also its temperature and atmospheric pressure in 1887 ... 3

PAGE.

Hudson, rainfall by months in 1887, at 5
  range of temperature, daily, by months, 1887, at 25
Hull, M. D., J. B., weekly reports of diseases by, for Bellaire 92
Humidity. (*See also Relative and Absolute Humidity.*)
  absolute, exhibits, diagram, and tables relative to, in 1887 27-29
  relative, diagram, table and exhibits relative to, in 1887 30-32
Hutchinson, M. D., B. M., weekly reports of diseases by, for Lyons 93
Hydrophobia and glanders, proposed legislation relative to xxxv.-xxxvi.
  during the year 1887 279-280
  a doubtful case of, at Homer 279-280
  House bill relative to restriction of xxxv.
Hyperinosis, relation of atmospheric ozone to, 148
  relation of, to rheumatism, pneumonia, and other diseases 148
  relation of, to narrow lymph spaces in connective tissue 148-150
  and pneumonia, predisposing causes of 147
Ice cream, reported poisoning by, at Bay City 195
Illuminating oil, letter from Dr. Baker concerning the testing of 199
  injuries alleged to have come from, in 1887 196-199
Infectious persons or substances, regulations relative to 217-220
Inflammation of kidney, curve representing per cent of reports of, in 1887 123
Inflammation of brain, curve representing per cent of reports of, in 1887 129
Inflammation of bowels, curve representing per cent of reports of, in 1887 129
Influenza, by months in 1887, compared with ten years 122
  curve representing rise and fall of, months, 1887, Diagram 2 121
  and scarlet fever, and meteorological conditions 125
  relation of, to atmospheric temperature, ten years, Diagram 152
  Table 167
  and meteorological conditions, by months, in 1887 125
  per cent of reports of in 1887, '86, and average for 10 years 122
  per cent of reports stating presence of, ten years, Table 151
  close relation of, to atmospheric temperature 145
  tonsilitis, croup, diphtheria and scarlet fever follow closely the fluctuations of atmospheric temperature 144, 151, 152, 153, 164, 167, 168, 169
Information, dissemination of, by State Board of Health xv
Inoculation of susceptible animals with *bacillus tuberculosis* causes consumption xxxix
Intermittent fever, tables relative to, in several countries lix
  curve representing rise and fall of, by months, in 1887, Diagram 3 135
  and meteorological conditions, by months, in 1887 134
  per cent. of reports of, in 1887, compared with previous years, Exhibit 133
International Medical Congress, Washington, D. C., Sept., 1887 xxxviii
International Medical Congress in Washington in 1887, reprint of paper read at 143-169
Inter-State Notification of Dangerous Communicable Diseases, blank for xv-xvi
  resolutions relating to xvi-xvii
Instruments, meteorological, exposure of, at Lansing in 1884 13
  purchased by State Board of Health, list of xvii
  change of exposure of, at Lansing in 1884 13
  meteorological, list of xvii
Ionia, absolute humidity, by months, 1887, at, Table 29
  average temperature, by months, 1887, at 19
  cloudiness, per cent. of, by months, 1887, at, Table 40
  extremes and range of temperature, by months, 1887, at 20, 21
  its latitude, longitude, elevation; also its temperature and atmospheric pressure in 1887 3
  ozone, day and night, by months, in 1887, at 54, 56
  range of temperature, daily, by months, 1887, at 25
  relative humidity, by months, 1887, at 31
  temperature, by months and year, 1887, at 19-26
  wind, velocity, direction of, etc., in 1887, at 67-70
Iron Mountain drinking water, and the causation of typhoid fever xlvi-xlvii

PAGE.

Isolation and disinfection, Table exhibiting the advantage of, in scarlet fever xxxiv
Jackson, a fire in, from gasoline 200
Jacokes, D. D., Rev., D. C., library books loaned to xxiii
Jewett, Dr., at Industrial Home for Girls, extracts from letter from 184
Jibb, Wm., letter from, concerning a lamp explosion at Adrian 198-199
Johnson, J. W., meteorological reports for Port Huron in 1887, received from 2
Johnson, M. D., Richard M., letter from, concerning poisoning at Novi 195-196
Johnson, M. D., S. A., weekly reports of diseases by, for Kalkaska 92
Johnston, J. G., meteorological reports for Ripley in 1887, received from 2
Jones, M. D., L. C., weekly reports of diseases by, for Petersburg 94
Jones, M. D., L. E., weekly reports of diseases by, for Montague 92
Jones, M. D., L. M., weekly reports of diseases by, for Brooklyn 93
Jones, M. D., H. W., weekly reports of diseases by for Houghton 92
Jones, M. D., F. B., letters from, concerning an alleged nuisance 286-287
Kalamazoo, absolute humidity by months, 1887, at, Table 29
  atmospheric pressure by months, 1887, at 72-76
  average temperature by months, 1887, at 19
  cloudiness, per cent of, by months, 1887, at, Table 40
  extremes and range of temperature by months, 1887, at 21, 20
  fogs, dates of, in 1887, at 36-39
  frosts and other local phenomena at 9, 11
  halos, solar and lunar, dates of in 1887, at 48-49
  its latitude, longitude, elevation; also its temperature and atmospheric pressure in 1887 3
  ozone, day and night, by months in 1887, at 54, 56
  rainfall by months in 1887, at 51
  range of temperature, daily, by months, 1887, at 25
  relative humidity, by months, 1887, at 31
  sunny and cloudy days in 1887, at 46-47
  temperature by months and years, 1887, at 19-26
  wind, velocity, direction of, etc., in 1887, at 64-70
Kapp, M. D, J., weekly reports of diseases by, for Ann Arbor 93
Kedzie, Prof. R. C., meteorological reports for Agricultural College, in 1887, received from .. 2
Kellogg, M. D., J. H., Battle Creek, committee on disposal of excreta vii
  committee on occupations, recreations and habits viii
  committee on relations of preventable sickness to taxation viii
  committee on plans for model school-houses viii
  date of expiration of term as member of State Board of Health vii
  meteorological reports for Battle Creek in 1887, received from 2
  report on examination of plans for cottage at Northern Asylum for Insane 175-176
  library books loaned to xxiv
Kent county, supposed anthrax in, in 1887 281-282
Kimball, John W., meteorological reports for Port Austin in 1887, received from 2
Koch, Dr. Robert, discovers the microbe of consumption xxxix
Laboratory of Hygiene, Michigan State xl
  at the State University, verbal report by Prof. Vaughan, director of .... xlvi-xlvii
Laing, M. D., J. B., weekly reports of diseases by, for Otisville 93
Lansing, S. B. of H., absolute humidity, by months, 1887, at, Table 29
  atmospheric pressure, by months, 1887, at 72, 76
  auroras, dates of, observed in 1887, at 43
  average temperature, by months, 1887, at 19
  cloudiness, per cent. of, by months, 1887, at, Table 40
  extremes and range of temperature, by months, 1887, at 20, 21
  fogs, dates of, in 1887, at 36-39
  frosts and other local phenomena at 8, 9, 10, 11, 12
  halos, solar and lunar, dates of, in 1887, at 48-49

PAGE.
Lansing, S. B. of H., its latitude, longitude, elevation; also its temperature and atmospheric pressure in 1887 3
    ozone, day and night, by months, in 1887, at 54, 56
    rainfall, by months, in 1887, at 51
    range of temperature, daily, by months, 1887, at 25
    relative humidity, by months, 1887, at 31
    sunny and cloudy days in 1887, at 43-44
    temperature, by months and year, 1887, at 19-26
    wind, velocity, direction of, etc., in 1887, at 58-70
Lapeer, typhoid fever cases in, and sources of contagion 255-256
Lathrop, M. D., E. H., weekly reports of diseases by, for Hastings 93
Law requiring plans for State public buildings to be examined by the State Board of Health 172
Laws of Mich., 1887, relating to public health and safety, abstract of .... xxxiv-xxxvii
    act to provide for introduction of safety gates on bridges xxxvii
    making appropriation for State weather service xxxiv
    act to prevent adulteration of candies and confectioneries xxxiv
    act for appointment of State Live Stock Commission xxxv
    act to regulate the transit of Texas cattle across this State xxxv
    act to provide for automatic car couplers in this State xxxv
    act to amend an act relative to live stock sanitary commission xxxv
    House bill for restriction of hydrophobia and glanders xxxv
    act for protection of lives of passengers and employes on trains xxxvi
    act to prevent the carrying of concealed weapons xxxvi
    act to provide for blowers where emery wheels are used xxxvi
    act to prohibit the employment of children under certain ages xxxvi
    act doing away with examination of text-books on physiology by State Board of Health xxxvi
    act to amend law to regulate practice of pharmacy xxxvi
    act to provide for appointment of inspectors of mines xxxvii
    act to prevent the sale of impure milk xxxvii
    act to provide for a Forestry Commission xxxvii
    act to provide for damages for injuries by defective streets, etc xxxvii
    act to amend "act to promote public health," student practitioners of medicine xxxvii
Legislation relating to public health and safety in Michigan in 1887 .... xxxiv-xxxvii
Library of State Board of Health, accessions to, by purchase xviii
        by gift, etc .... xviii-xxii
        by exchange .... xxii-xxiii
    loans from .... xxiii-xxvii
    names of donors to .... xviii-xxii
Lincoln, M. D., C. H., weekly reports of diseases by, for Armada 94
    township, Midland county, alleged nuisance in 286
Live-stock Sanitary Commission, legislative acts relative to xxxv
    act creating 276
    president of 277
Livonia, Wayne county, diphtheria at .... xlv-xlvi
Loans from library .... xxiii-xxvii
Loco weed, investigation of the nature of the poison in, by Prof. Vaughan xlvii
London township, Monroe county, glanders in 276-277
Lump-jaw (actinomycosis), in cattle, in 1887 280-281
Lupinski, Dr., letter concerning anthrax in Kent county 281
Lymph-spaces in connective tissue, relation of atmospheric ozone and of hyperinosis to narrowness of 148-150
    relation of chloride of sodium in the air passages to 150
    narrowness of, predisposes to tuberculosis 148-150
Lyon, M. D., J. J., weekly reports of diseases by, for Zilwaukee 93
Lyster, A. M., M. D., Henry F., Detroit, committee on Epidemic, Endemic, and Contagious diseases vii

PAGE.

Lyster, A. M., M. D., Henry F., committee on sewerage and drainage vii
  committee on alcoholic liquors viii
  date of expiration of term as member of State Boardof Health vii
  method of restricting the spread of diphtheria, recommended by xlv-xlvi
  report on diphtheria at Livonia, Wayne county xlv-xlvi
  library books loaned to xxiv

Mackinaw City, absolute humidity by months, 1887, at, Table 29
  atmospheric pressure by months, 1887, at 72, 76
  auroras, dates of, observed in 1887, at 43
  average temperature by months, 1887, at 19
  cloudiness, per cent of, by months, 1887, at, Table 40
  extremes and range of temperature by months, 1887, at 20, 21
  fogs, dates of, in 1887, at 36, 39
  frosts at 8, 9, 10, 11
  halos, solar and lunar, dates of in 1887, at 48, 49
  its latitude, longitude, elevation, also its temperature and atmospheric pressure in 1887 3
  ozone, day and night, by months in 1887, at 54, 56
  rainfall by months in 1887, at 51
  range of temperature, daily, by months, 1887, at 25
  relative humidity, by months, 1887, at 31
  sunny and cloudy days in 1887, at 44
  temperature by months and year, 1887, at 19, 26
  wind, velocity, direction of, etc., in 1887, at 60-70

Manistee, abstract of proceedings of sanitary convention held at xxxi-xxxii

Marsh, M. D., W. C., weekly reports of diseases by, for Quincy 94

Marshall, absolute humidity by months, 1887, at, Table 29
  atmospheric pressure by months, 1887, at 72, 76
  average temperature by months, 1887, at 19
  cloudiness, per cent of, by months, 1887, at, Table 40
  extremes and range of temperature, by months, 1887, at 20, 21
  fogs, dates of in 1887, at 36-39
  its latitude, longitude, elevation, also its temperature and atmospheric pressure in 1887 3
  ozone, day and night, by months, in 1887, at 54, 56
  rainfall, by months, in 1887, at 51
  range of temperature, daily, by months, 1887, at 25
  relative humidity, by months, 1887, at 31
  temperature, by months and year, 1887, at 19-26
  wind, velocity, direction of, etc , in 1887, at 64-70
  alleged nuisance of a hog pen in 288-289
  supposed fatal burning by gasoline at 201

Marshall, M. D., E. J., weekly reports of diseases by, for Marshall 94

Marquette, absolute humidity by months, 1887, at, Table 29
  atmospheric pressure by months, 1887, at 72, 76
  auroras, dates of, observed in 1887, at 43
  average temperature by months, 1887, at 19
  cloudiness, per cent of, by months, 1887, at, Table 40
  extremes and ranges of temperature by months, 1887, at 20, 21
  fogs, dates of, in 1887, at 36-39
  frosts and other local phenomena at 8, 9, 11, 12
  halos, solar and lunar, dates of, in 1887, at 48-49
  its latitude, longitude, elevation; also its temperature and atmospheric pressure in 1887 3
  ozone, day and night, by months in 1887, at 54, 56
  rainfall by months in 1887, at 51
  range of temperature, daily, by months, 1887, at 25

PAGE.

Marquette, relative humidity, by months, 1887, at 31
temperature, by months and year, 1887, at 19-26
wind, velocity, direction of, etc., in 1887, at 60-70
Martin, M. D., C. M., weekly reports of diseases by, for Greenville 93
Marvill, Lewis, meteorological reports for Parkville in 1887, received from 2
Mason, M. D., A. E., weekly reports of diseases by, for New Buffalo 93
Matthes, C. F., letters from, concerning plans for cottage at State Industrial Home for Girls, Adrian 176-178
Mattison, M. D., G. W., weekly reports of diseases by, for Middleville 93
Maynard, M. D., H. C., weekly reports of diseases by, for Hartford 93
McCallum, M. D., G. B., weekly reports of diseases by, for Monroe 94
McColl, Dr. H. letter and diagram from—typhoid fever in Lapeer City liii-liv
on typhoid fever cases at Lapeer 255-256
McGurk, M. D., J. R., weekly reports of diseases by, for Capac 92
McKain, M. D., C. H., weekly reports of diseases by, for Vicksburg 94
McKenzie, M. D., M., weekly reports of diseases by, for Laingsburg 93
McLeod, C. E., D. A., library books loaned to xxvii
McMullen, M. D., B. H., weekly reports of diseases by, for Morley 92
Mead, M. D. J. M., library books loaned to xxvi
Meade township, Huron county, glanders in 277
Measles during the year ending December 31, 1887 263-270
periodicity and prevalence of 264-265
cause of periodicity of 265-267
curve representing rise and fall of sickness and deaths from, eleven years Diagram 266
the average age of those sick from 267
at what time of year do most outbreaks of, occur 267
measures of restriction of 267-268
the contagious principle of 268
source of contagium of, in 1887 268-269
how sometimes spread 269
how may be restricted 269-270
influence of age upon mortality from 270
number of cases and deaths and per cent of cases to deaths, Table 270
and meteorological conditions by months in 1887 137
curve representing per cent of reports of, in 1887 123
per cent of reports of, in 1886, 1887, and average, 1877-'86 133
curves representing sickness and deaths from, in eleven years, Diagram 266
Members of the State Board of Health, names, addresses, terms of office, etc. vii-viii
Membranous croup, curve representing rise and fall of, by months, in 1887, Diagram 2 121
prevalence of, by months, in 1887, and meteorological conditions 120
per cent of reports of, in 1887, 1886, and average for ten years 122
Meningitis, cerebro-spinal, curve representing rise and fall of, months, 1887, Diagram 3 135
Merritt, M. D., S. W., weekly reports of diseases by, for Fort Gratiot 93
Meteors, where observed in 1887 34
Meteorological statistics, uses made of, and articles prepared from 1
Meteorological conditions, in Michigan, in 1887 1
comparison of in 1887, with preceding years 115
names of stations where were observed certain, Exhibit 114
comparison between averages of certain, in 1887 and previous years, Exhibit 115
relations of bronchitis to 116-117
relations of pneumonia and other cold-weather diseases to 117-118
relations of diarrhea to 128
principal, in 1887 1-77
relations of cholera infantum and other warm weather diseases to 130-131
relations of, to total amount of sickness 141
at Agricultural College in 1887, and previous years, Exhibit 6-7
relation of, to diseases of the lungs and air passages 143-169

PAGE.
Meteorological characteristics of 1887 at one central station 4-5
Meteorological phenomena in 1887, local 8-12
Meteorological instruments, list of xvii
Meteorological reports xii
Migration of birds, etc., in 1887 9-11
Milk, impure, act to prevent the sale of, in Michigan xxxvii
Millar, F. B. meteorological reports for Mackinaw city in 1887, received from 2
Millard, M. D., O. weekly reports of diseases by, for Flint 93
Mills, M. D., C., weekly reports of diseases by, for Richmond 94
Mines, law relative to appointment of inspectors of xxxvii
Mitchell, M. D., D. W., weekly reports of diseases by, for Harrisville 92
  meteorological reports for Harrisville in 1887, received from 2
Moffit, M. D., R. C., weekly reports of diseases by, for Lawton 93
Moore, M. D., W. K., weekly reports of diseases by, for Algonac 92
Moore, M. D., J. J., weekly reports of diseases by, for Farmington 94
Morgan, M. D., S. E., weekly reports of diseases by, for Howard City 93
Mottram, M. D., Wm., weekly reports of diseases by, for Kalamazoo 94
Mowry, M. D., H. P., weekly reports of diseases by, for Bronson 93
Mueller, Joseph E., meteorological reports for Grand Haven in 1887, received from 2
Munson, Dr. James D., Supt. of Northern Asylum, plans by, commended by State Board of Health .... xliv-xlv
  letter from, in regard to cottage at northern asylum for insane 172-175
Names and addresses of health officers, method of obtaining, and total number .... ix-x
  of medical practitioners, method of obtaining .... x-xii
    blank for obtaining xi
  of meteorological observers xii
  of observers of diseases 92-94
  addresses, etc., of the members of State Board of Health .... vii-viii
  of donors to library arranged alphabetically .... xvii-xxii
National Conference of State Boards of Health, on Inter-State notification of dangerous communicable diseases .... xv-xvii
  conference of State Boards of Health xxxiii
Neuralgia, by months in 1887, compared with ten years 122
  curve representing rise and fall of, months, 1887, Diagram 4 123
  curve represening per cent of reports of, in 1887 123
  per cent of reports of, in 1887, '86, and average for eight years 122
  and meteorological conditions, by months, in 1887 126
Novi, Oakland county, poisoning at 195-196
Nuisances in Michigan in 1887, alleged 283-297
  proposed amendment of the law relative to 296
  alleged, sawdust in a stream 293
    swamp near union school building 293-294
    rinsing water and waste from a creamery 294
    proposed cemetery near a residence 294
    wells within sixty feet of a cemetery 294-295
    school house near a cemetery 295
    injuries from uneven sidewalks 295
    cow-yard adjoining residence 295-296
    garbage from Detroit, pollution of Detroit river 297
    whey box at a cheese factory 291
    at Chippewa Lake, Mecosta county 289
    relative to one near Ionia 170-171
    in Lincoln township, Midland county 286
    in Bath, Clinton county 287-288
    logs and brush in a stream 290
    feeding slaughter house refuse to hogs 290-291
  manure pile, is it a public or private 286-287

PAGE.

Nuisance, an alleged, at Harrison, Clare county 288
alleged, of a hog-pen at Marshall 288-89
how can a township health officer legally abate a 283-284
ordinary, privies, etc., the regulation of 292-293
Nunn, M. D., J. R., weekly reports of diseases by, for Vassar 93
Newberry, Luce county, glanders in the village of 277-278
Observers, number from whom weekly reports of sickness were received by months in 1887, Exhibit 88
per cent of, reporting each of twenty-seven diseases in 1887 and preceding years, Table 95-97
Œdema of lymph channels in lungs, its causation by chloride of sodium, and relation of, to consumption and other diseases of the lungs and air passages 150
Œdema of lungs always present in poisoning by chlorate of sodium 150
Osmosis, law of, applicable in the study of diseases of the lungs and air passages 146, 150, 151
Ostrander, M. D., H., weekly reports of diseases by, for Lansing 93
library books loaned to xxvi
Otsego, average temperature by months, 1887, at 19
cloudiness, per cent of, by months, 1887, at, Table 40
temperature by months and year, 1887, at 19-26
wind, velocity, direction of, etc., in 1887, at 65-70
Owosso, abstract of proceedings of Sanitary Convention held at .... xxx-xxxi
Ozone, atmospheric, in 1887, tables, exhibits, and diagrams relating to 53-57
night, average, by months, in 1887, at seven stations, Diagram 57
average, by months, in 1887, at eleven stations, Table 56
day, average by months, in 1887, at seven stations, Diagram 55
average by months, in 1887, at eleven stations, Table 54
observations for at Lansing 54
day, comparison by year and months in 1887 with previous ten years, and with 1886, Exhibit 53
night, comparison by year and months, in 1887, with previous ten years, and with 1886, Exhibit 53
atmospheric, may cause hyperinosis, and thus pnemonia, pleuritis, rheumatism, consumption, etc 148-150
Palmer, Dr. E. N., letter from concerning an alleged nuisance 299
M. D., Geo. C., meteorological reports for Asylum for Insane at Kalamazoo in 1887, received from 2
Paper on hand, used, etc., by State Board of Health .... xxvii-xxviii
Papers in the Annual Report of the Board, resolution relative to the printing of .... iv-vii
Park, M. D., C. S., weekly reports of diseases by, for Hubbardston 93
Parker, M. D., D. L., weekly reports of diseases by, for Marine City 93
Parker, Hon. Leroy, library books loaned to xxiii
Parker, M. D., I. E., weekly reports of diseases by, for Dryden 92
Parkville, fogs, dates of in 1887, at 36-39
local phenomena at 8, 9, 11, 12
rainfall, by months in 1887, at 51
Parmenter, Dr. Wm., letter from, concerning varioloid at Vermontville 274
Parsons, M. D., C. D., weekly reports of diseases by, for Burr Oak 93
Passengers and employés on railroads, law for protection of xxxvi
Pharmacy, amendment of law relating to practice of xxxvi
Phthisis, deaths from in London, Eng., relation of to average atmospheric temperature, by months, thirty years, Diagram 161
Table 168
changes in death rate from, follow two months later than changes in atmospheric temperature 161, 168
Physicians, lists of by clerks of cities, villages and townships, sent to State Board of Health. x
Physicians' weekly reports of sickness 80
Plans for Model schoolhouses, committee on viii
blank for securing information on .... xii-xiii

PAGE.

- Plans examination of, for public buildings and for sewerage at State institutions ... xxxii
  - for cottage at Northern Asylum for Insane ... xliv
  - for State public buildings examined by State Board of Health ... 172
  - for a new cottage at Northern Asylum for Insane ... 172-175
  - for new building at State School for Girls at Adrian ... 176
  - of northern prison at Marquette ... 178
  - for proposed cottages at the Eastern Asylum for Insane ... 178
  - for sewer from State Reform School ... 179
- Pneumonia, epidemic of, in Ingham county ... xlv
  - curve representing rise and fall of, by months, in 1887, Diagram ... 87
  - relations of, and other cold-weather diseases, to meteorological conditions ... 117-118
  - prevalence of, by months, in 1887, and meteorological conditions ... 120
  - and meteorological conditions, in 1887 ... 120
  - prevalence of, by months, in 1887, compared with ten years ... 122
  - may sometimes result from sudden exposure to cold ... 143
  - frequently proceeded by bronchitis ... 145
  - hyperinosis and, predisposing causes of ... 147
  - relation of sickness from, to average atmospheric temperature, by months, eight years, Diagram ... 155
  - Table ... 167
  - in U. S. armies, relation of atmospheric temperature to, by months, three years, Diagram ... 156
  - Table ... 167
  - relation of deaths from, in London, England, to average atmospheric temperature, by months, thirty years, Diagram ... 157
  - Table ... 168
  - relation of sickness from, to daily range of barometer, by months, four years, Diagram ... 158
  - Table ... 168
  - per cent of reports of, in 1887, 1886, and average for ten years ... 122
  - decreases as absolute humidity increases, and increases as it decreases ... 166, 169
  - relation of sickness from, to absolute humidity, by months, ten years, Diagram ... 166
  - Table ... 169
- Poisonings in 1887, tyrotoxicon and other ... 194-196
- Polhemus, M. D., W. P., weekly reports of diseases by, for Hastings ... 93
- Poor-houses, sanitary inspection of, plans of sewerage, etc ... xlv
- Port Austin, absolute humidity by months, 1887, at, Table ... 29
  - average temperature by months, 1887, at ... 19
  - cloudiness, per cent of, by months, 1887, at Table ... 40
  - extremes and range of temperature by months, 1887, at ... 20, 21
  - fogs, dates of, in 1887, at ... 36-39
  - frosts and other local phenomena at ... 11, 12
  - its latitude, longitude, elevation, also its temperature and atmospheric pressure in 1887 ... 3
  - ozone, day and night, by months in 1887, at ... 54, 56
  - range of temperature, daily, by months, 1887, at ... 25
  - relative humidity, by months, 1887, at ... 31
  - temperature by months and year, 1887, at ... 19-26
  - wind, velocity, direction of, etc., in 1887, at ... 68-70
- Port Huron, absolute humidity by months, 1887, at, table ... 29
  - atmospheric pressure by months, 1887, at ... 72, 76
  - auroras, dates of, observed in 1887, at ... 43
  - average temperature by months, 1887, at ... 19
  - cloudiness, per cent of, by months, 1887, at, Table ... 40
  - extremes and range of temperature by months, 1887, at ... 20-21
  - fogs, date of, in 1887, at ... 36-39
  - frosts and other local phenomena ... 8, 11
  - halos, solar and lunar, dates of in 1887, at ... 48-49

PAGE.

- Port Huron, its latitude, longitude, elevation; also its temperature and atmospheric pressure in 1887 ... 3
  - ozone, day and night, by months in 1887, at ... 54, 56
  - rainfall by months in 1887, at ... 51
  - range of temperature, daily, by months, 1887, at ... 25
  - relative humidity, by months, 1887, at ... 31
  - temperature by month and year, 1887, at ... 19-26
  - wind, velocity, direction of, etc., in 1887, at ... 60-70
- Postage, amount of, and principal items of, for fiscal year ending June 30, 1888 ... xxviii
- Postal blank for weekly report of sickness in Michigan ... 81
- Pratt, M. D., Foster, library book loaned to ... xxvi
- Pray, M. D., G., weekly reports of diseases by, for Wood's Corners ... 93
- Prevalence, the time of greatest, of each disease ... 79-142
- Price, M. D., A., weekly reports of diseases by, for Almont ... 92
- Prison, at Marquette, plans of northern ... 178
- Property of State Board of Health, report of the Secretary relative to ... xvii-xxix
- Puerperal fever, curve representing per cent of reports of, in 1887 ... 123
- **Quarantine** does not deal with the most dangerous diseases ... liii
- Quarterly reports, presented by the Secretary, State Board of Health, abstracts of ... xlviii-lx
- Quincy, Houghton county, typhus fever at, in 1887 ... 282-283
- **Rabid** dog, a supposed, at Flint ... 279
- Railroad passengers and employes, act for protection of life of ... xxxvi
- Rainfall in Michigan, average by months for ten years and 1885, '86, '87, Table ... lv
  - by months, in 1887, at seven stations, Diagram ... 50
  - in 1887, Diagram, Table and Exhibits relative to ... 50-52
  - comparison by year and months in 1887, with previous twenty-three years, and with 1886, at Agricultural College, Exhibit ... 52
- Rain and melted snow, by year and months in 1887, at seventeen stations, Table ... 51
  - average in 1887, compared with previous ten years and with 1886, Exhibit ... 52
- Rankin, M. D., J. M., weekly reports of diseases by, for Richland ... 94
- Ranney, M. D., Geo. E., library book loaned to ... xxv
- Read, M. D., L. C., weekly reports of diseases by, for Sandusky ... 93
- Redtenbacher, Dr., observations of, in regard to absence of chloride of sodium from urine in pneumonia ... 145
- Reeves, M. D., J. S., weekly reports of diseases by, for East Tawas ... 92
- Relations of certain meteorological conditions to diseases of the lungs and air passages ... 143-169
- Relative humidity, average, by year and months in 1887, and previous years, Exhibit ... 32
  - average, at Agricultural College in 1887, and previous years, Exhibit ... 32
  - average, by year and months, at stations in 1887, Table ... 31
  - by months, in 1887, eight stations, Diagram ... 30
- Remittent fever, per cent of reports of, in 1887, compared with previous years, Exhibit ... 133
  - and meteorological conditions, by months in 1887 ... 134
  - curve representing rise and fall of, by months in 1887, Diagram 3 ... 135
- Reports, weekly, of diseases ... ix
    - compilation of, in health bulletins ... ix
  - final, of outbreaks of dangerous diseases and blank ... xiii-xiv
    - blanks for accessory ... xiv
  - of sickness ... 80
  - plan of weekly card reports by physicians ... 80-81
  - of sickness, compilation of weekly card ... 82
  - per cent of, in 1887 and previous years, stating the presence of diseases, Exhibit ... 89-91
- Report, of a committee to investigate slaughter houses near State House of Correction at Ionia, 170-171
  - of the secretary relative to property, etc ... xvii-xxix
- Resolution of the Board relative to the printing of papers in its Annual Report ... iv, vii
- Resolutions of the Board relative to cases of sore throat suspected to be diphtheritic ... xli
- Respiration, influence of dress on ... xli
- Respiratory diseases in India decrease as atmospheric temperature increases, and increase as it decreases ... 165, 169

PAGE.
Respiratory diseases in London, England, relation of, to average atmospheric temperature,
by months, three years, Diagram 165
Table, 169
Rheumatism, by months in 1887, compared with ten years 122
curve representing rise and fall of, months, in 1887, Diagram 4 123
and neuralgia, and meteorological conditions 126
per cent. of reports of, in 1887, 1886, and average for ten years 122
curve representing per cent. of reports of, in 1887 123
and meteorological conditions, by months, in 1887 126
Ripley, absolute humidity by months, 1887, at, Table 29
average temperature by months, 1887, at 19
cloudiness, per cent. of, by months, 1887, at, Table 40
extremes and range of temperature, by months, 1887, at 20, 21
fogs, dates of, in 1887, at 36-39
frosts and other local phenomena at 8, 9
halos, solar and lunar, dates of in 1887, at 48-49
its latitude, longitude, elevation; also its temperature and atmospheric pressure in 1887 3
relative humidity, by months, 1887, at 31
temperature by months and year, 1887, at 19-26
wind, velocity, direction of, etc., in 1887, at 67-7
Ritter, M. D., T. J., weekly reports of diseases by, for Dexter 93
Roller, M. D., L. A., weekly reports of diseases by, for Edmore 93
Rollman, M. D., J. C., weekly reports of diseases by, for Burr Oak 93
Root, M. D., Hon. W. W., library books loaned to xxvi
Rouse, M. D., W. H., weekly reports of diseases by, for Detroit 94
Ruggles, Chas. F., library books loaned to xxvii
Sanborn, M. D., R. H., weekly reports of diseases by, for Maple Rapids 93
Sand Beach, supposed small-pox at 275
Sanford, John P., library book loaned to xxvii
Sanitary survey of cities and villages xii
committee on viii
Sanitary conventions, abstracts of, held at Traverse City, Owosso, Albion and Manistee xxx-xxxii
convention at Manistee xl
Sanitary survey of cities and villages xl
Sanitary inspection of poor-houses, plans of sewerage, etc xlv
Scarlet fever, table, exhibiting the average number of cases and deaths under isolation and disinfection, and the same neglected xxxiv
how it comes to Michigan, hektograph letter lii-liii
per cent. of reports of, in 1887, 1886, and average for ten years 122
by months, in 1887, compared with ten years 122
curve representing rise and fall of, by months, 1887, Diagram, 2 121
and meteorological conditions, by months, in 1887 125
relation of to average atmospheric temperature, by months, ten years 159
Table 168
year ending December 31, 1887 239-252
in 1887 compared with previous years 239-241
map showing distribution of in 1887 240
number of outbreaks, cases and deaths from, Table 241
source of contagium of, in 1887 242
traced to a former case, in 1887 242-245
practical results in restricting, in 1886-7 248-251
attributed to unsanitary conditions, in 1887 246
measures taken to restrict 246-247
in 1887, average cases and deaths from, per outbreak, Table 249
Diagram 250
period of incubation of 551-252
how long will the contagium of continue active 252

PAGE.

Scarlet fever, curve representing rise and fall of, by months in 1887, Diagram 2 121
Schaberg, M. D., H. H., weekly reports of diseases by, for Kalamazoo 94
Schoolhouses, plans for model rural .... xii-xiii
Schools, examination of text-books on physiology in xxxvi
Secor M. D., T. J., weekly reports of diseases by, for Midland City 92
Seger, M. D., F. R., weekly reports of diseases by, for Adrian 93
Sewerage, plans of, sanitary inspection, etc., of poorhouses and State institutions xlv
Sheridan, Montcalm county, suspected glanders reported from near 278
Shorts, M. D., Hon. P. P., library books loaned to xxvii
Sickness, contributions to the study of the causes of 79-142
    climate and 116
    what diseases cause most 110
    statistics of, over wide areas, and comparison with meteorological conditions 142
Slaughter-houses near house of correction near Ionia 170-171
Slaughter-house and hog-yard in a village 285
Small-pox, changes in death rate from, follow two months later than changes in atmospheric temperature 160
    atmospheric temperature controls the prevalence of 160
    in London, England, relation of, to average atmospheric temperature, by months, thirty years, Diagram 160
    Table 168
    prevention of 202-208
    restriction of 208-212
    disinfection in 212-213
    during the year ending December 31, 1887 274-276
    in Detroit 274
    supposed, at Sand Beach 275
    in 1887 compared with preceding years 275-276
    in other States than this 276
    prevention and restriction of 202-221
Smead dry-closet system, report of a committee on xlii
Smith, M. D., Fred K., weekly reports of diseases by, for Allouez 92
    H. P., weekly reports of diseases by, for Mackinaw city 92
Southard, M. D., W. B., weekly reports of diseases by, for Kalamazoo 94
Spicer, M. D., C. E., weekly reports of diseases by, for Marcellus 93
Spinning, M. D., J. O., weekly reports of diseases by, for Litchfield 94
State Board of Health, names, addresses, expiration of terms, etc., of the members of .... vii-viii
State Board of Health, expenditures by, for fiscal year 1888, and calendar year 1887 xxix
State Board of Health ,expenditures on account of the, how provided for xxix
State Boards of Health, national conference of xxxiii
State House of Correction, analysis of ice water from the pond near 171
State House of Correction, at Ionia, report of investigation of slaughter houses near 170-171
State Industrial Home for Girls, Adrian, typhoid fever at .... xliii-xliv
    outbreak of typhoid fever at 179-186
State institutions, resolution concerning sewerage, drainage, and plumbing of xiv
State Laboratory of Hygiene xl
State prison, Jackson, report concerning outbreak of typhoid fever at 186-194
State public buildings, examination of plans for 172-179
State Reform School, examination of plan for sewer at 179
State school for girls at Adrian, examination of plans for buildings at 176-78
Stations at which the meteorological observations used in exhibits relative to sickness, were made 114
Stephenson, M. D., O. M., weekly reports of diseases by, for Fort Gratiot 93
Stephenson, John J., meteorological reports for Escanaba in 1887, received from 2
Stoddard, M. D., J. P., weekly reports of diseases by, for Muskegon 92
Stokvis B. J., experiments by, on poisoning by chloride of sodium 150
Stone, M. D., G. W., weekly reports of diseases by, for Metamora 93
Stonex, M. D., H. A., weekly reports of diseases by, for Long Rapids 92

PAGE.
Streets, defective, act to provide for damages for injuries, by xxxvii
Sunshine and clouds, in 1887, by months, at stations 43-47
Swartz Creek, absolute humidity by months, 1887, at, Table 29
auroras, dates of, observed in 1887, at 48
average temperature by months, 1887, at 19
cloudiness, per cent. of, by months, 1887, at, Table 40
extremes and range of temperature by months, 1887, at 20, 21
fogs, dates of, in 1887, at 36-39
frosts and other local phenomena, at 8, 9, 10, 11
halos, solar and lunar, dates of in 1887, at 48-49
its latitude, longitude, elevation; also its temperature and atmospheric pressure in 1887 3
ozone, day and night, by months, in 1887, at 54, 56
rainfall by months, in 1887, at 51
range of temperature, daily, by months, 1887, at 25
relative humidity, by months, 1887, at 31
sunny and cloudy days in 1887, at 45-47
temperature by months and year, 1887, at 19-26
wind, velocity, direction of, etc., in 1887, at 67-70
Swift, Dr. J. M., letter from concerning outbreak of diphtheria 234
weekly reports of diseases by, for Northville 94
Table I., temperature, average at each and of all of 17 stations, by months, in 1887. 19
II., temperature, extremes of, at each of 17 stations in 1887 20, 21
III., temperature, average daily range of, at 17 stations, in 1887 25
IV., absolute humidity, average, by months, at 16 stations, in 1887 29
V., relative humidity, average, by months, at 16 stations, in 1887 31
VI., cloudiness, average per cent of, at 17 stations, in 1887 40
VII., rain and melted snow, inches of, at 17 stations, in 1887 51
VIII., ozone day, relative amount of, in the atmosphere, at 11 stations, in 1887 54
IX., ozone, night, relative amount of, in the atmosphere, at 11 stations, in 1887. 56
X., wind, average velocity of, at the State Capitol, by hours, and months, in 1887 58
XI., wind, average velocity per hour, by months, at 9 stations, in 1887 60
XII., XIII., wind, direction of, at 17 stations, in 1887 63-85
XIV., wind, direction of, at 23 stations, in 1887 67-70
XV., atmospheric pressure, average daily range of, at each of 16 stations, in 1887. 71
XVI., atmospheric pressure, monthly range and average monthly range of, at each of 16 stations, in 1887 72
XVII., atmospheric pressure, average for each month of 1887, at each of 16 stations 76
1, average per cent of observers, who reported presence of 27 specified diseases, in each of the eleven years 1877-87 95-97
2, weekly reports of diseases in Mich. in 1887, exhibiting for the year, and each month of the year, a summary relative to diseases in the State 98-107
4, summary for the year 1887, relative to diseases in each of the eleven divisions of the State 108, 109
1, temperature, and sickness from influenza by months, for 10 years, 1877-'86 151, 167
2, temperature, and sickness from tonsilitis, by months, for 8 years, 1879-'86 167
3, temperature, and sickness from bronchitis, by months, for 9 years, 1877-'85 167
4, temperature, and sickness from pneumonia, by months, for 8 years, 1877-'84 167
5, temperature, and sickness from pneumonia in the U. S. armies, by months, for 3 years, 1862-'64 167
6, temperature, and deaths from pneumonia in London, Eng., by months, for 30 years 1845-'74 168
7, range of atmospheric pressure, and sickness from pneumonia, by months, for 4 years, 1882-'85 168
8, temperature, and sickness from scarlet fever, by months, for 10 years, 1877-'86 168

PAGE.

Table 9, temperature, and deaths from small-pox in London, Eng., by months, for 30 years, 1845-'74 ... 168
  10, temperature, and deaths from phthisis in London, Eng., by months, for 30 years, 1845-'74 ... 168
  11, temperature, and sickness from consumption, by months for 9 years, 1878-'86 ... 169
  12, temperature, and deaths from bronchitis in London, by months, for 30 years, 1845-'74 ... 169
  13, temperature, and sickness from croup, by months, for 10 years, 1877-'86 ... 169
  14, temperature, and sickness from "respiratory diseases," among native troops, in India, by months, for three years, 1883-1885 ... 169
  15, absolute atmospheric humidity, and sickness from pneumonia, by months, for 10 years, 1877-'86 ... 169
  —, numbers of places at which communicable diseases were reported, for each week, 1887 ... 223
  — diphtheria, cases and deaths from, ratio of deaths to cases of, for each of the six years, 1882-'87 ... 226
  — number of outbreaks of diphtheria, beginning, and the number ending, in each month, in 1887 ... 226
  — diphtheria in 1887, reported sources of contagium, in outbreaks of ... 227
  — diphtheria in 1887, average number of cases and deaths per outbreak of ... 235
  — diphtheria in 1887, reported period of incubation in 35 instances of ... 237
  — relative to diphtheria, in twenty instances, in 1887, the reported period of incubation, within certain limits, stated in days ... 238
  3, per cent of cases which recovered from typhoid fever in specified periods of time in 1887 ... 260
  3½, time of year by months in which outbreaks of typhoid fever began, in 1886 and 1887 ... 261
  4, time of year by months in which outbreaks of typhoid fever began and ended, in 1887 ... 261
  5, cases of, and deaths from typhoid fever by months, in 1887 ... 261
  6, by sex of patient, the age at which typhoid fever occurred, in 1887 ... 262
  1, outbreaks, localities, cases and deaths from typhoid fever, in 1884, '85, '86 and '87 ... 254
  7, source of contagium of typhoid fever, in 1887 ... 255
  2, average duration of typhoid fever in 1887 ... 260
Taggart, Hon. Moses, letter from, concerning the reporting of whooping-cough ... 273
Temperature of water in well, by months, in 1887, Exhibit ... 14-15
  atmospheric, average in Michigan, in 1887 ... 17-19
  extremes of, in Michigan, in 1887 ... 20, 21
  in 1887 compared with 1886 and 23 years, 1864-86, at the Agricultural College ... 22
  by year and months, for 8 years, 1879-86, at the State Capitol, Lansing ... 22
  average daily range of, by year and months in 1887, at stations ... 23
  average daily range of, in 1887, compared with 1886, and the 13 years, 1874-'86, at the Agricultural College ... 23
  diagram, average daily range of, in 1887 ... 24
  table, average daily range of, in 1887, at 17 stations ... 25
  extremes of, in 1887, compared with those of the 14 years, 1873-'86 ... 26
  average relation of influenza to, ten years, Diagram ... 152
  relation of tonsilitis to, by months, eight years, Diagram ... 153
  relation of bronchitis to, by months, nine years, Diagram ... 154
  relation of pneumonia to, by months, eight years, Diagram ... 155
  relation of pneumonia to, in U. S. armies, by months, three years, Diagram ... 156
  relation of deaths from pneumonia to, in London, by months, thirty years, Diagram ... 157
  number of observations used in paper on diseases of the lungs and air passages ... 143
  average daily range of, in 1887, compared with previous eight years, and with 1886, Exhibit ... 23

PAGE.

- Temperature average daily range of, in 1887, compared with previous 13 years, and with 1886, at Agricultural College, Exhibit 23
  - average, in 1887, compared with 1886, and previous 8 years at Lansing, Exhibit 22
  - average, in 1887, compared with previous 23 years, and with 1886, at Agricultural College, Exhibit 22
  - extremes of, in 1887, at stations, Table 20-21
  - average, by year and months in 1887, at 17 stations, Table 19
  - average, by months in 1887, at 7 stations, Diagram 18
  - average, by year and months in 1887, compared with previous 10 years, Exhibit 17
  - statements concerning, in 1887, and previous years 16
  - average relation of scarlet fever to, by months, 10 years, Diagram 159
  - relation of, to deaths from small-pox in London, Eng., by months, 30 years, Diagram 160
  - relation of, to deaths from phthisis in London, Eng., by months, thirty years, Diagram 161
  - extreme range of, for 1887, and previous 14 years, Exhibit 26
  - average daily range of, in 1887, at 17 stations, Table 25
  - average daily range of, in 1887, at 9 stations, Diagram 24
  - average relation of consumption to, by months, nine years, Diagram 162
  - relation of, to weekly deaths from bronchitis in London, England, by months, thirty years, Diagram 163
  - relation of, to croup, by months, ten years, Diagram 164
  - relation of to sickness from respiratory diseases in India, by months, three years, Diagram 165
  - by months, ten years, Table 151
- Texas cattle, law relating to transit of, through Michigan xxxv
- Time, of greatest prevalence of each disease 79
- Thornville, absolute humidity by months, 1887, at, Table 29
  - atmospheric pressure by months, 1887, at 72, 76
  - auroras, dates of, observed in 1887, at 43
  - average temperature by months, 1887, at 19
  - cloudiness, per cent. of, by months, 1887, at, Table 40
  - extremes and range of temperature by months, 1887, at 20, 21
  - fogs, dates of, in 1887, at 36-39
  - frosts and other local phenomena, at 8,9,10,11,12
  - halos, solar and lunar, dates of in 1887, at 48-49
  - its latitude, longitude, elevation; also its temperature and atmospheric pressure in 1887 3
  - ozone, day and and night, by months, in 1887, at 54-56
  - rainfall by months, in 1887, at 51
  - range of temperature, daily, by months, 1887, at 25
  - relative humidity, by months, 1887, at 31
  - sunny and cloudy days in 1887, at 45
  - temperature by months and year 1887, at 19-26
  - wind, velocity, direction of, etc., in 1887, at 64-70
- Three Rivers, St. Joseph county, glanders at 278
- Tonsilitis, by months, in 1887, compared with ten years 122
  - curve representing rise and fall of, months, 1887, Diagram 2 121
  - curve representing rise and fall of, by months, in 1887, Diagram 2 121
  - per cent of reports of, in 1887, '86, and average for eight years 122
  - and meteorological conditions, by months, in 1887 124
  - relation of, to average atmospheric temperature, by months, 8 years, Diagram 153
  - Table 167
- Topping, M. D, G. W., letter from, concerning reporting cases of whooping-cough 272
- Total sickness, average disease, what it is 140
  - relation of to meteorological conditions 141
- Townsend, Titus S., meteorological reports for Escanaba in 1887, received from 2
- Traverse City, abstract of proceedings of Sanitary Convention, held at xxx, xxxiii